FOOD INDUSTRIES

manufacturing and processing

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Thoughts on the Chemical Show

ONE who has studied the exhibits of equipment and apparatus on display at the Chemical Show cannot fail to be impressed with the development of new forms of machinery for the food industries that parallels the development of equipment for the process industries. Indeed, the conclusion forces itself upon the beholder that food manufacture is in itself a process industry differing in method and principle but very slightly from the industries more commonly regarded as chemical engineering industries. The difference is found largely in the chemistry of food manufacture, for admittedly even the qualitative chemistry of foods is only partially understood.

THE common utilization of process and control equipment was strikingly illustrated. A casual observer could not be always certain whether the exhibit before him found its greatest use in food or non-food processes. And in some cases his opinion would be based upon his own point of view, as for example in the case of starch machinery, for starch is a food or a chemical depending upon the use to which it is put.

SOME of the colloid mills that were on display seem to possess grinding possibilities far beyond anything previously suspected, and if one may be bold enough to venture a prophecy they will come into direct competition with buhrstone mills in certain wet operations in addition to their natural competitor, the homogenizer.

A RELATIVE humidity recorder is a novelty that should not be overlooked by those food manufacturers who must maintain close control or ruin the product. Heretofore there has been no accurate method of indicating relative humidity without calculation or reference to charts. Sifting devices, alloys, corrosion resistant materials, evaporators and mixing equipment have been perfected to a degree that hardly seems capable of further perfection, but in this age of development anything is possible.

MANY exhibits of equipment familiar to all food manufacturers showed the observer who might be primarily interested in foods that his field was only a fraction of the total fields served by them, and included such lines as automatic bottling machinery, cappers, labelers, carton sealers, air conditioning apparatus; cleaning materials; corrosion resistant metals and alloys. There also were cookers, evaporators and driers; kettles, hoists and filters; in short, so much equipment common to both process and food industries that it would be simpler to enumerate those, such as coke ovens, which have no apparent immediate use in food manufacture than to attempt to name the food equipment.

Birth of the Consumers and Producers Foundation of America

ELSEWHERE in this issue is mentioned a new organization of the non-profit making variety to be known as the Consumers and Producers Foundation of America, designed to increase the earning and buying power of the nation and to reduce preventable sickness and poverty by means of a bettered food supply.

Without challenging the good intentions of those entering this movement, one can but wonder how long it will last. It has voluntarily assigned to itself a task that is veritably stupendous in magnitude and as full of complexities as any field of activity of which we have any knowledge. It will be a matter of interest to watch developments.

An Unsuspected Source of Trouble

TWO new types of food spoilage on a commercial scale have been recently discovered that are of great interest to readers of FOOD INDUSTRIES. One of them was described in April under the title of "Infected Ice Causes the Discoloration of Halibut," by Harrison and Sadler. The other type is discussed by Donald B. Shutt elsewhere in this issue and pertains to a sewage-like flavor that may develop in butter.

Curiously enough, both of these apparently unrelated forms of food spoilage are due to the single species of bacteria, *Pseudomonas fluorescens,* which hitherto has not been regarded as an organism of commercial importance. Let it be well understood that *Ps. fluorescens* is an organism of no pathological significance, at least in its relation to man. Water supplies may be contaminated by this organism without being potentially dangerous to health, and the usual presumptive tests of such water supplies will fail to disclose the evidence of such a contamination.

Regarding the possible rôle of *Ps. fluorescens* in other branches of the food industries one cannot venture a prediction, but it seems probable that in addition to the industry of fishing and that of butter-making there also will be an idea contained in these two articles for manufacturers whose products are washed with water and preserved by refrigeration, such as oleomargarin and butterine.

Foods or Medicines?

IN the wild scramble to get business food manufacturers take advantage of every favorable claim that can be made for their products. Of late years there is an increasing tendency to employ the health-giving features of foods as reasons for the public to consume more of this or that. But in playing up the healthful aspects of a diet based on a given food the fine line of demarcation between healthfulness and therapeutic values may soon be reached, to cross which means that one is selling medicine and not food.

Aside from the fact that federal government labelling regulations on this point are very strict, as can easily be observed by referring to the last annual report of the Department of Agriculture, there is a very good economic reason why the food manufacturer should avoid confusing the public's mind. The moment food advertising creates a popular subconscious knowledge that the particular food possesses *medicinal* value the food acquires a medicinal aspect, and failure is just around the corner. If there were the margin of profit in food manufacture that exists in most medicinal preparations there would be no reason for this statement. The market for medicine is quite limited as compared with the outlet for food. It is economically much safer to keep on selling food.

Statistical Data on Mayonnaise

AT THE request of the Mayonnaise Products Manufacturers Association, the U. S. Department of Commerce recently sent to about 600 known manufacturers of that form of salad dressing a questionnaire designed to gather detailed information thereon, both technical and economic, accompanied by a personal letter signed by President McCormick of the association. Heretofore no such census has been taken, the present action being eloquent testimony to the dietetic importance of mayonnaise and kindred products.

It is greatly to be desired that prompt and full cooperation be given by the manufacturers so addressed. Should this reach the eye of a mayonnaise manufacturer who failed to receive his questionnaire blank (Department of Commerce Inclosure No. 23,427) the omission will be rectified instanter upon request to R. S. Hollingshead, of the Foodstuffs Division of the U. S. Department of Commerce, Washington, D. C.

Why "Coal-Tar" Colors?

WHENEVER the words coal tar are used to qualify the origin of synthetic organic dyestuffs they indicate that the colors so described are manufactured from the complex black substance known as coal tar. The connection between the certified colors permitted to be used in foods and coal tar is so remote that to call them coal-tar food colors appear to be a miscarriage of common sense.

Without claim to being a purist in the literary sense, whenever one hears a person speak of "coal-tar" colors one is reminded of the situation that existed not so many years ago when many parents forbade their children drinking ice cream sodas because they had heard somewhere that charged water was made from crushed stone and sulphuric acid!

We hold no brief for the artificial coloring of foods, neither do we condemn it here. For the moment the ethics and the economics of the practice do not interest us. Our interest is temporarily confined to the odd circumstance that when foods are artificially colored by a synthetic dye the color usually is called a coal-tar color but if any substance other than a food is artificially colored it is simply dyed or tinted.

Any baker knows that soda is quite important for the production of a very desirable crisp brown, and in making some products the right shade of color is dependent to a large degree on the amount of soda in the batter. However, in the manufacture of baking soda, a very important rôle is played by coal, tar and ammonia.

Although ammonia comes from a variety of sources of which coal and coal tar are very important, no one ever thinks of the not-too-remote connections between coal and soda.

If consistency is to be followed one should speak of synthetic colors or artificial colors and avoid the use of the words coal tar in this connection.

Every Man Cannot Be His Own Micro-Analyst

LEGALLY speaking ethyl alcohol is not a food and therefore not exactly within the domain of FOOD INDUSTRIES, but nevertheless we feel constrained to comment upon a vest-pocket device that was exhibited at the Chemical Industries Exposition that has for its purpose the qualitative detection of methyl or wood alcohol in ethyl alcohol. Admittedly there is a market for such a form of apparatus—as also exists for an easy method for the detection of pyridine, fusel oil, kerosene and other miscellaneous poisons—on the part of illegal purchasers and vendors of contraband liquids. But, unfortunately, qualitative organic analysis is a subject of so great difficulty that it is usually taught to students in universities only after several years of previous chemical training. The method in question involves not only qualitative organic chemistry but calls for manipulations of tiny apparatus on a microscopic scale—also a difficult subject to master.

Although the proper technique of this qualitative analysis is not impossible to achieve we are strongly opposed to the attempt to popularize the test. The analytical procedure is based on a standard laboratory test known to all chemists, but its use calls for the manipulative skill of an experienced chemist. We feel that we are justified in urging the layman to let it alone, if for no other reason than that it may lead to a false sense of security, because there is a grave possibility of obtaining negative tests in the presence of methyl alcohol.

Can Agriculture Be Made More Profitable Without Making It Ultimately Unprofitable?

WITH few exceptions manufacturers of foods have a dual interest in the agricultural relief. One basis of this interest is the indirect effect of relief on the purchasing power of the agricultural group. The other reason is in the direct effect of relief measures upon the cost of the raw materials of the food industries, for a very large proportion of these raw materials either come from American farms or take a price that is regulated in some direct or indirect manner by prices paid to the farmer.

It is to be hoped, however, that any measures adopted by the Congress now in session will be such that a vicious circle will not be established. Just as soon as farming becomes more profitable it is a certainty that not only will more people engage in farming but more land will be brought into cultivation. This in turn will bring about a greater overproduction of agricultural products and, with a normal foreign demand, if it does not bring about a more acute depression of agricultural prices it will impose a stupendous burden on whatever price-maintaining machinery may then be in existence.

Price control without production control will inevitably led to overproduction. The method or formula for agricultural relief to be adopted that can be successful must be based on this economic law.

It is a fundamental of all research that a problem must first be stated clearly and accurately. Therefore, in the present instance we believe it would be well to state the problem as we see it. The question is not how to relieve the farmer of existing economic distress but rather how to make farming profitable without increasing the total production of the country.

If this is the correct statement of the problem that this country must solve then it follows directly that export debentures and tariff revision alone will not afford a real relief, for they will only tend toward making agriculture profitable without preventing overproduction. Rather, it is believed that the effective solution will be obtained first by devising a method of diverting sub-marginal lands from the production of immediately marketable crops, and then by the intelligent use of tariff barriers bring the super-marginal producers into a desirable economic balance with industry.

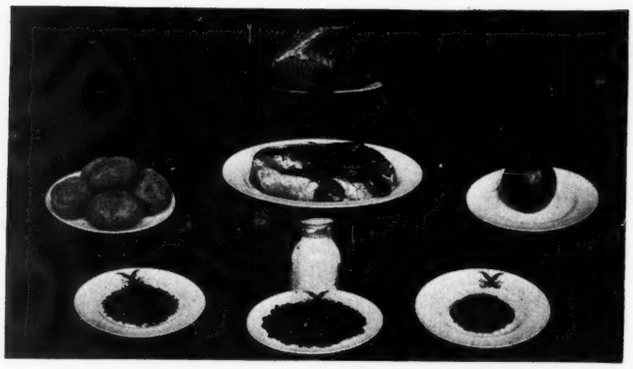
Saving the Fish From Death on the Farm

THE relationship of Western agriculture to salmon canning may seem at first thought to be one so divergent as to be an absurdity until the life habits of the salmon are understood. With a thorough comprehension of the problem it will easily be seen, however, that agricultural practices may have a very direct bearing on the future of certain salmon-canning plants in the Pacific Northwest. Two facts are the basis of the relationship: (1) that the salmon—a salt-water fish—spawns in fresh water streams often hundreds of miles inland, and (2) that the young salmon fry migrate to the sea and seem nearly always to return in their adult stages to the rivers of their birth for spawning.

The young fry that migrate out to sea begin their journey down mountain streams that frequently are sources of irrigation water and, if they are not prevented, millions of them are drawn off from the main body of every such salmon stream to follow the water down the irrigation ditches to their ultimate death. To state that all fry lost in this manner represent an equivalent depletion of the numbers of adult salmon is incorrect, because only a fractional per cent of them ever live to maturity, but such huge losses of the young without question eventually will exert a detrimental effect in the future.

The problem has received the attention of the Bureau of Fisheries but the various devices and expedients that have been tried out have met with indifferent success until comparatively recently. The solution probably will be found in some type of screen that will be fine enough to keep the fry out of the ditches and yet strong enough to withstand the force of the water and accumulated débris. Until the solution is reached the increasing demand of agriculture in these regions for irrigation water will adversely influence the future commercial fishing possibilities of many streams.

How the *Navy* Buys Its *Foodstuffs*



A daily ration laid out

By FREDERICK KRASSNER
Chief Chemist,
U. S. Naval Supply Depot, Brooklyn

THE purpose of this article is to present a brief account of the testing of foodstuffs purchased by the Navy, in order to insure conformity with the standards of quality and purity set forth in the federal requirements. It might be well first to point out the variability of the Navy ration, and incidentally to show that the diet of those who "roam the deep sea" is not confined to the famous navy bean as the chief ingredient of the daily mess. An outline of the Navy ration as allowed by law is given herewith (Sections 1580 and 1581, Revised Statutes, amended by the act of June 29, 1906). The quantities refer to the daily and weekly allowances for each man:

DAILY

1 lb. hard bread (biscuits), or 1¼ lb. of fresh bread, or 1⅛ lb. flour.
1 lb. (canned) meat, or 1¼ lb. salt meat, or 1¼ lb. smoked meat, or 1¾ lb. fresh fish, or 8 eggs, or 1¾ lb. poultry.
⅔ lb. (canned) vegetables, or 1⅔ lb. fresh vegetables, or 3 gills beans or peas, or ½ lb. rice or other cereal.
2 oz. coffee, or 2 oz. cocoa, or ½ oz. tea.
1 oz. evaporated milk, or $\frac{1}{16}$ qt. fresh milk.
$\frac{3}{16}$ lb. dried fruit, or ⅜ lb. (canned) fruit, or $\frac{5}{16}$ lb. fresh fruit. (One ration of fruit is allowed with each ration of dried vegetables, canned vegetables, and rice, or other starch foods issued.)
2 oz. butter. 4 oz. sugar.
7 lb. lard for every 100 lb. flour used as bread.

WEEKLY

¼ lb. cheese.
¼ lb. macaroni.
$\frac{1}{32}$ lb. pepper.
¼ lb. pickles.
$\frac{1}{32}$ lb. mustard.
¼ lb. salt.
¼ pt. syrup.
$\frac{1}{128}$ lb. spices.
¼ lb. tomatoes (canned).
½ pt. vinegar or oil.

The enlisted man also obtains his share of such items as oysters, clams, ice cream, cakes, pies, candy, nuts, etc., not classified in the foregoing, and issued under a miscellaneous classification.

How does the Navy Department safeguard its personnel against inferiority or adulteration in the various kinds of provisions purchased? A modern, well-equipped chemical laboratory is maintained at the Naval Supply Depot, which is adjacent to the Bush Terminal, Brooklyn, N. Y. A laboratory staff of chemists qualifying under the U. S. Civil Service Regulations, is busily engaged in performing tests on samples representative of materials delivered to the different naval stations throughout the country. Acceptance or rejection is recommended on the basis of carefully prepared analytical reports from the laboratory; without regard to trade mark, and the contractor is informed accordingly. All provisions are tested for conformity with definite specifications. Copies of specifications can be obtained from the Bureau of Supplies and Accounts, Washington, D. C. These specifications are revised periodically to meet the specific needs of the Navy Department and to meet changing conditions. They are also kept uniformly in harmony with U. S. Department of Agriculture regulations, as well as trade practices and customs.

The object at all times is to obtain the product that will best serve the needs at the minimum cost. In this work the Bureau of Supplies and Accounts is constantly safeguarding the interests of the taxpayers by making every effort to attain the foregoing object. The interests of manufacturers and contractors, moreover, are looked after by a specification committee, whose duty it is to investigate complaints arising out of misleading or restrictive requirements in specifications. Whenever it is found that changes are justified, this committee makes a study of such changes as are needed to avoid the objectionable features in future contracts.

The fundamental requirement to be met by all foodstuffs, and included in every provision specification, is the following: "Shall conform in all respects to the federal food and drugs act of June 30, 1906, and to the subsequent decisions of the U. S. Department of Agriculture, as well as to the laws of any state or city in which deliveries are made, in so far as such laws are

applicable thereto." This requirement insures freedom from adulterations of any kind, and instances of specific adulteration are very rare. Deviation from specified requirements is a more common occurrence but often such deviations are unintentional.

It might be of some assistance to manufacturers and contractors doing business with the Navy to note some of the grounds upon which acceptances or rejections are based. It should be pointed out that in general most contractors are able to meet the Navy requirements, and that rejections constitute a minor part of Navy business, the Navy being primarily interested in accepting pure and wholesome foodstuffs for its enlisted personnel. The Navy Department does not endeavor to be unduly technical in its decisions, yet the system of purchase of all commodities through competitive bids places an obligation upon its inspection force to accept only material that is in strict accordance with specifications, and to recommend rejection of all other kinds.

Acceptance of foodstuffs is based upon conformity with the general and detailed requirements of the specifications, with which the contractor should be thoroughly familiar before making deliveries. The requirements also include specific directions as to marking and packing, which must be adhered to. The procedure involves the procurement of representative samples of the various items purchased under contract. These are subjected to physical, chemical or microscopical tests in the laboratory. The physical examination considers the appearance, odor, taste, flavor, etc.; all of which must correspond to a definite standard of wholesomeness and in general to the current season's crop for each item under examination. The physical examination, together with tests to insure freedom from adulteration constitute the general requirements.

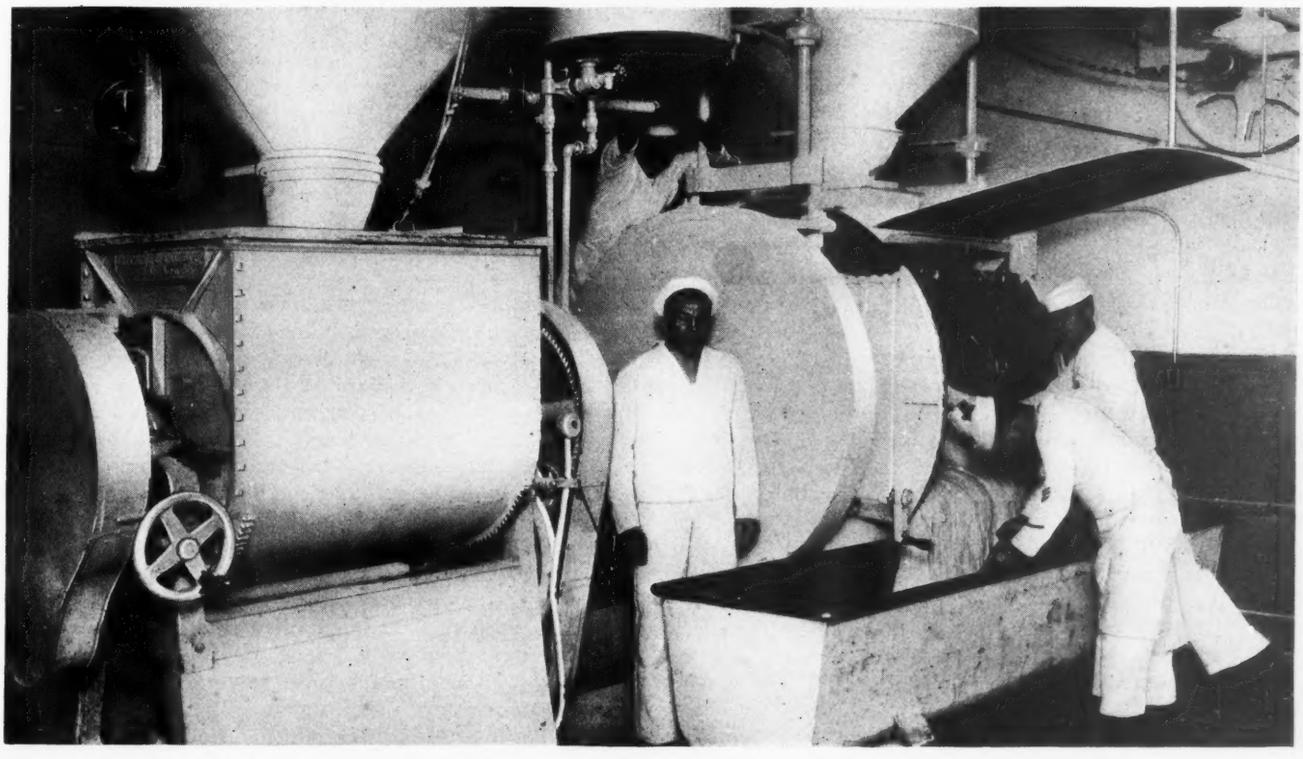
The detailed requirements, which differ for the various items, are based upon the content of moisture, fat, protein, sugar, starch, acidity, ash, crude fiber, volatile and non-volatile ether extracts, etc. The exact percentages of the foregoing are determined by the latest official methods in effect at the time of invitation of bids, and these methods, which are referred to in specifications, govern in the event of controversy. Microscopic tests are conducted as required to determine percentages of molds, bacteria, and spores. Also such characteristics as iodine number, refractive index, saponification number, specific gravity, etc., are ascertained when necessary.

For example, of the many varieties of beans, such as navy beans, kidney beans, lima beans, etc., for which there are several grades, the U. S. grade No. 1 is the only one purchased by the Navy. In ascertaining whether a delivery is U. S. grade No. 1, the examination involves the determination of the percentages of splits, damage, foreign material, etc., which must conform to the standards established by the U. S. Department of Agriculture. The general appearance as to uniformity and discoloration is taken into consideration, as well as whether the beans are of the current season's crop.

Through co-operation with the Bureau of Agricultural Economics, sets of framed standards have been obtained that are used as guides for comparison. The moisture content is then determined. This is an important factor, both in respect to flavor in cooking and keeping qualities in storage. The method used is the same as that by which the moisture content is, or should be, standardized in the trade, namely, a distillation method involving the use of the official Brown-Duvel moisture tester. If a delivery meets the foregoing physical requirements and does not contain an excess of moisture, the beans have passed the laboratory tests and are acceptable.

Flour is purchased and used in large quantities by the Navy and the tests for this product are of interest. The quality of the gluten as indicated by experimental baking tests, as well as the quality of loaf of bread obtainable, is a factor in evaluation of the general properties

The bakeshop at Naval Training Station, Hampton Roads, Va.



of the flour. The protein requirement is significant as it should come within the minimum of the requirements, which are based upon crop conditions. Moreover, as the proteins in flour, as well as other products, are sources of muscular tissue, by virtue of the amino acids arising from them, this constitutent takes on an added significance, and a deficiency usually is a cause for rejection.

An excess of moisture in flour also must be guarded against, due to the fact that in the large quantities stored, deterioration may take place rapidly in the presence of an excess beyond the permissible limit. Moreover, payment is made on the basis of weight delivered, and since deliveries sometimes average about a million pounds, the element of moisture may become an appreciable factor, if present even in slight excess. Essentially the same tests are applied to other flours and flour products, such as graham flour, biscuits spaghetti, and the like.

The best assurance that products will comply with specifications, of course, is obtained by careful standardization on the part of the contractor, preliminary to making delivery. When deviations from the specified requirements are indicated—and these deviations are considered material—a re-examination is performed on additional samples to ascertain whether the deviation is uniform for the entire delivery. If the re-examination is satisfactory, the delivery is accepted, but if the original results are sustained, rejection is recommended. In many instances such rejections as do occur can be avoided.

Occasionally products are tested by contractors prior to making delivery, and subsequently, upon being tested in the Navy laboratory, are reported as not meeting the specifications. In such instances the contractor is at a loss to understand the causes of the rejections, and he usually sends his chief chemist to the Navy laboratory to ascertain the exact basis for the conclusions. Where authority is granted by the Bureau of Supplies and Accounts, a re-examination is made in his presence so that he may obesrve the methods used.

Usually such controversies resolve themselves into the matter of the proper "official method" to be used, different methods usually yielding different results. A recent interesting example of this involved the rejection of a large shipment of breakfast cocoa. The cocoa used by the Navy is tested for the following ingredients: total ash, crude fiber, acid insoluble ash, and fat. The minimum fat content required is 22 per cent, and the material under examination showed on analysis about 1 per cent less than the specified amount, which is considered a significant deficiency, in view of the fact that the cocoa butter is the most expensive ingredient present. The deficiency was reported to the contractor, who sent his chief chemist to the Navy laboratory with an array of figures indicating that analysis at their plant showed the proper fat content. It developed that the method used by the contractor was an "unofficial" one, and yielded higher results than the "official method" used by the Navy. Under the circumstances, acknowledgment was made of the correctness of the decision in this matter, and replacement made.

The use of the correct "official method" in factory standardization is thus a matter of great importance. The Navy laboratory follows the methods of the Association of Official Agricultural Chemists at all times, as well as the revisions of these methods appearing in the latest journals of the association. Keeping up to date with these methods, as revised from time to time, is important for manufacturers dealing with government agencies, and situations like the foregoing often can be obviated by exact information concerning the analytical methods used by the contractor.

A similar situation exists in the matter of moisture content, which apparently is a simple thing to standardize, and yet difficulties are encountered from time to time in deliveries of such products as beans, flour, biscuits, spaghetti, etc., due to excess moisture. Rejections necessarily must be recommended where the moisture content is found to be greater than the maximum allowed by specifications, for such products will, in the long run, represent a loss to the Navy by premature spoilage or fermentation. Proper control prior to delivery should overcome this difficulty in most cases, although care must be exercised that the method stated in specifications has been used. In the testing of beans, as stated previously, the official Brown-Duvel moisture tests, authorized for grains under the grain standard act, is used. In view of the fact that the moisture content of flour is defined in terms of the vacuum oven method, the latter, if available should be used.

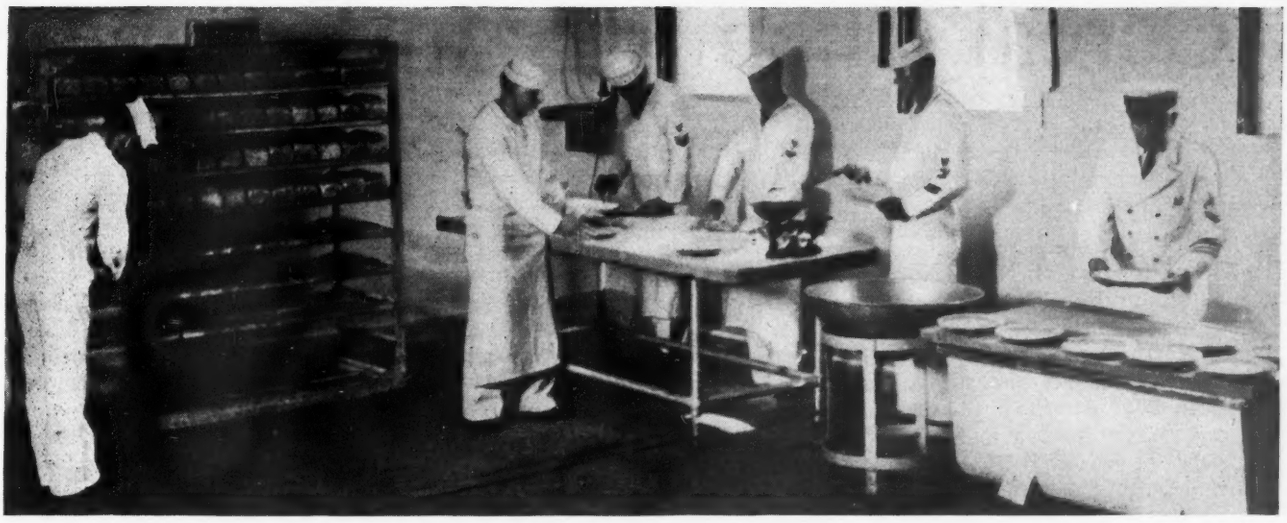
Results comparable to those of the vacuum oven method are obtained by a rapid air oven method that recently has been made official by the Association of Official Agricultural Chemists, and should prove of considerable advantage in routine standardizations where results are desired in a short period of time. The method consists essentially in heating the material in an oven at 130 deg. C. for one hour, and yields remarkably close checks with the method of heating for 5 hours at 100 deg. in a vacuum oven. The method is being extended to other cereals and cereal products, so that more rapid standardization for moisture content should now be possible with the same degree of efficiency as heretofore.

Another difficulty occasionally encountered is in connection with the examination of salad oil, the specifications for which include any edible vegetable oil, such as cottonseed, peanut, corn oil, etc. The oil most frequently furnished is cottonseed oil, and the requirements call for a thoroughly refined, deodorized oil, free

THAT UNCLE SAM is a generous patron of the food industries is attested by the annual purchases of the Navy, which include—among many other items—the following carload quantities:

Vegetables, 2,430
Meat, 1,690
Flour, 525
Fruit, 340
Sugar, 225
Milk, 85
Butter, 70

Manufacturers who contemplate bidding on naval or other federal service requirements will profit much from this description of federal buying methods and regulations.



The bakeshop at Naval Training Station, San Diego, Calif.

from rancidity and objectionable flavor and capable of withstanding the 5-hour cold test. Salad oil that fulfills these requirements corresponds to a prime grade of winter oil and is considered satisfactory.

Deliveries at times fail to meet the "cold test" and exhibit a cloudiness or congealing at the expiration of the test, due to the fact that the oil has not been thoroughly winterpressed. Incomplete removal of stearin will cause this turbidity when subjected to the cold test, and renders such material rejectable. While such oil undoubtedly can be used, it is considered unsatisfactory for the grade of oil being purchased, in view of the fact that an oil that will be clear, brilliant and limpid at the end of the cold test, is obtainable. In this case, as well as in other similar ones, careful control prior to shipment should obviate any such difficulties.

Various uncontrollable factors sometimes enter into the matter of rejections, as well as the element of misinterpretation of specifications. Due allowances are made for such contingencies when they arise, and every effort is made to render fair decisions on the basis of the best opinions obtainable.

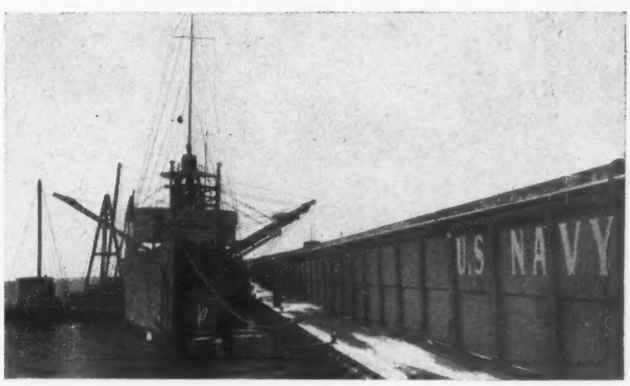
It might be pointed out here that a great portion of the foodstuffs purchased by the Navy is canned products; inasmuch as it is easier for ships to carry canned products to sea than to load up with the greater bulk of fresh products, which involve the problem of refrigeration and storage space. Furthermore, in a series of experiments conducted by the Navy during the year 1927 it was found that a diet including a liberal quantity of well-chosen canned foods, supplemented by milk, potatoes and the leafy vegetables, sustained the morale of the crews at a very high degree of efficiency from a physiological standpoint. When it is considered that during the year 1927 the Navy purchased 19,162 tons of canned products, or about a pound a day per man, the significance of such a diet, from a scientific standpoint, becomes apparent. It may therefore be of interest to point out briefly how quality in canned foods is determined.

The inspection of most canned goods such as fruits, vegetables, meat products and the like is conducted by a trained inspection officer and his assistants, the basis of judgment being general appearance and organo-leptic tests, as well as comparisons with standards, whenever the latter are available. These tests are carried out in an experimental kitchen, adjoining the laboratory. Tests often are made to determine cooking qualities also. Wherever tests are required for preservatives, artificial coloring, acidity, etc., samples are furnished by the laboratory and tested accordingly by chemists. An inspector from the Bureau of Animal Industry assists in the examination of meat products and canned fish.

In determining the quality of canned fruits and vegetables, which are perhaps the largest items in quantity, several factors are taken into consideration. As probably is understood, the grades in general recognized by the trade are: Fancy, choice (or extra standard), standard and substandard. Of these the Navy uses mainly the choice quality. In canned fruits the factors which determine choice quality are points such as size, freedom from blemish, ripeness, density of syrup, delicacy of flavor and general appearance. Likewise with canned vegetables, size, color of liquid, firmness, discoloration, ripeness and general appearance are used as a basis of grading in order to ascertain whether the delivery is choice quality.

Doing business with the Navy should be beneficial to manufacturers not only from a financial point of view but also because it brings about a thorough familiarity with the Navy requirements and standards, which conform, in general, to the best commercial standards. In this way a high standard of quality beneficial to the industry as a whole as well as the consumer is brought about.

Loading supplies on board navy supply ship at the Naval Supply Depot, Brooklyn



Cereal Chemistry in Europe

By D. W. KENT-JONES
Dover, England

MOST European cereal chemists will agree that in many respects, North America has certainly become the real home of cereal chemistry. This is not surprising when it is remembered what a large proportion of North American wheat is used all over the world for breadmaking and also the large quantity of North American flour exported to Europe and elsewhere. A multitude of interesting and useful papers have in recent years been issued in America and the work of the experimental stations and farms has done much to advance our knowledge of cereal chemistry. Among the many first-class men in America who have been attracted to this work were Osborne and Snyder, who are both now dead. There are, however, still left in the domain of cereal chemistry giants such as C. H. Bailey, Swanson, Alsberg, Gortner, and many others.

On the other hand, Europe has not been so much behind hand, although the problems of interest to the European cereal chemist are not necessarily those which attract American investigators. Among the pioneers of the subject will be remembered the name of William Jago, whose "Technology of Breadmaking," although rather old, still stands as the classic work on the subject. Mr. Jago still takes a keen and active interest in cereal chemistry and it is my privilege to keep in close contact with him. Jago, more than anyone else, may be regarded as the father of scientific breadmaking.

One cannot forget the name of Humphries, whose contributions to the science of milling are too well known to comment upon. His collaboration with Sir R. H. Biffen has been particularly helpful and has resulted in the production of a better and stronger class of English wheat; namely, Yeoman. At the present moment there is considerable interest in agricultural chemistry in the University of Cambridge, where Woodman appears to be continuing the excellent and well-known work that Wood did many years ago.

For some time much of the progress in cereal chemistry in England was due to the efforts of the laboratory of Messrs. Woodlands, Ltd., at Dover, over which I have the honor of presiding. Although this firm was mainly interested in the selling of their own products, primarily for use in the milling industry, the directors took a broad view and encouraged, at no inconsiderable expense, cereal chemical investigations over a wide range; many of these investigations were performed without any immediate commercial motive in view. The laboratory staff of Messrs. Woodlands, Ltd., still numbers fourteen. They are favored in that they receive problems from millers and often bakers from all over the world and this has meant that they have accumulated a wide range of useful knowledge.

More recently, the Research Association of the British and Irish Millers has come into existence. The work of Fisher, the director, and his able staff is undoubtedly being appreciated over a wider field than England at the present moment. Although many of the practical reports of this association are restricted to private circulation among members, it is interesting to note that they have published some papers of more academic interest in the American journal, *Cereal Chemistry*.

In France, the study of cereal chemistry has attracted able investigators, such as Arpin, Chopin, Pecaud, etc., and they seem worthy successors to the earlier pioneers represented by Fleurent, and Girard.

From Central Europe there still emanates the well-known text book by Maurizio entitled "Nahrungsmittel aus Getreide." In Germany, the name of Mohs will be well known to American readers, as he also has published work in *Cereal Chemistry*. Excellent work

Cereal chemistry laboratory of Woodlands, Ltd., Dover, England

is being done in Germany also by Ritter and Berliner and others.

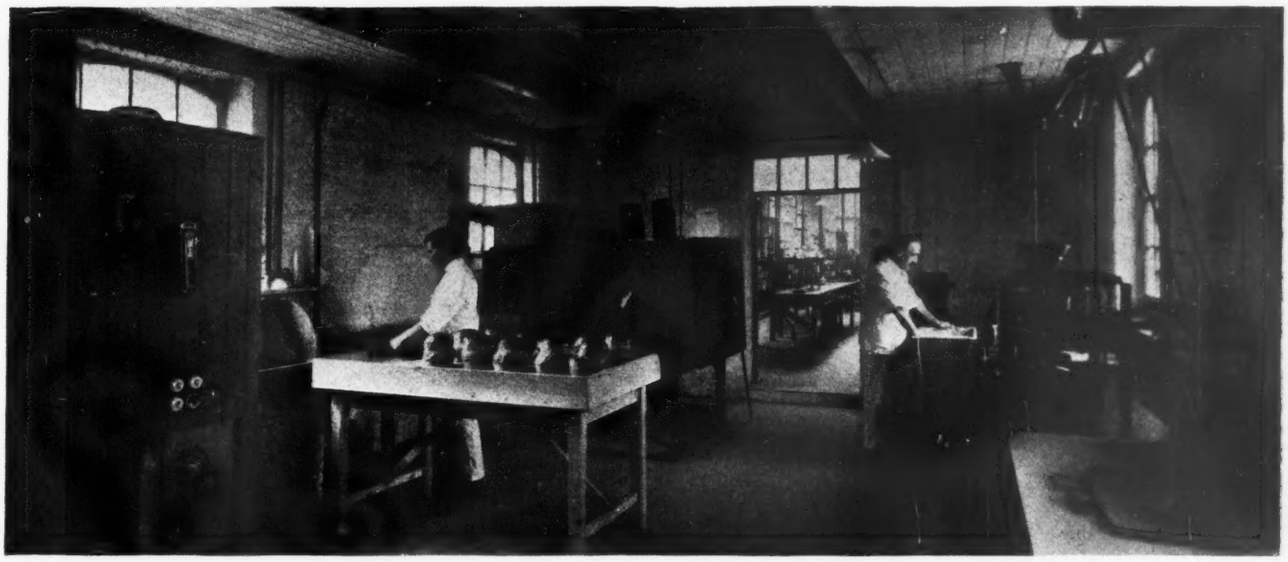
It is interesting to note that many of the European investigators are devoting much of their time and attention to the important matter of the diastatic value of flour and most of this work is based on the excellent suggestions of Rumsey, the American cereal chemist. It is strange, therefore, that America does not seem so interested in the diastatic value of flours as Europe, but this may be partly accounted for by the fact that blending of wheats does not have to be and is not practiced to the same extent as in Europe. The European miller has to know the exact characteristics of the wheats he uses, not only as regards protein but also diastatic power and other qualities, if he is to blend them successfully.

The work in cereal laboratories in Europe appears on the whole to be more varied than in America, where routine tests are mainly restricted to moisture, ash and protein. There seems a tendency in Europe to neglect unduly the protein test. Certainly one never hears of mills doing two to three hundred protein tests a day, as sometimes occurs in America.

In Denmark excellent work is at present being done by Jörgenson, whose recent pamphlet on flour color has attracted considerable interest, although it deals mainly with the yellowness of flour and not with the dullness of flour, which is imparted to it by the presence of finely ground offal. It does not yet seem sufficiently recognized that the evaluation of carotin color in flour is not sufficient to judge its color. Tests for bran powder, whether of the ash nature or by the estimation of the deterioration in the color and brightness of the flour, are certainly of guidance to those planning mills. The future no doubt will see more recourse to the services of the chemist in flour color determinations, in both carotin and bran colorations.

American cereal chemists will be conversant also with the name of Jessen-Hansen, of Copenhagen, whose classic work on the effect of hydrogen-ion concentration on loaf volume attracted considerable attention. Recent work, however, would seem to indicate that too much importance has been attributed to the influence of hydrogen-ion concentration in breadmaking, but the work of Jessen-Hansen still remains monumental, for it at one time at least gave a working hypothesis to what was then an inexact science. Even today there are two schools of thought, some chemists, particularly Dunlap, Cohn, and Henderson in America and Dearsley in New Zealand, still being convinced that the hydrogen-ion concentration of the dough is one of the main factors affecting the size of the resultant loaf, while others, notably Bailey in America and Fisher in England, hold that increase in hydrogen-ion concentration does not necessarily mean increase in loaf volume and better baking qualities generally.

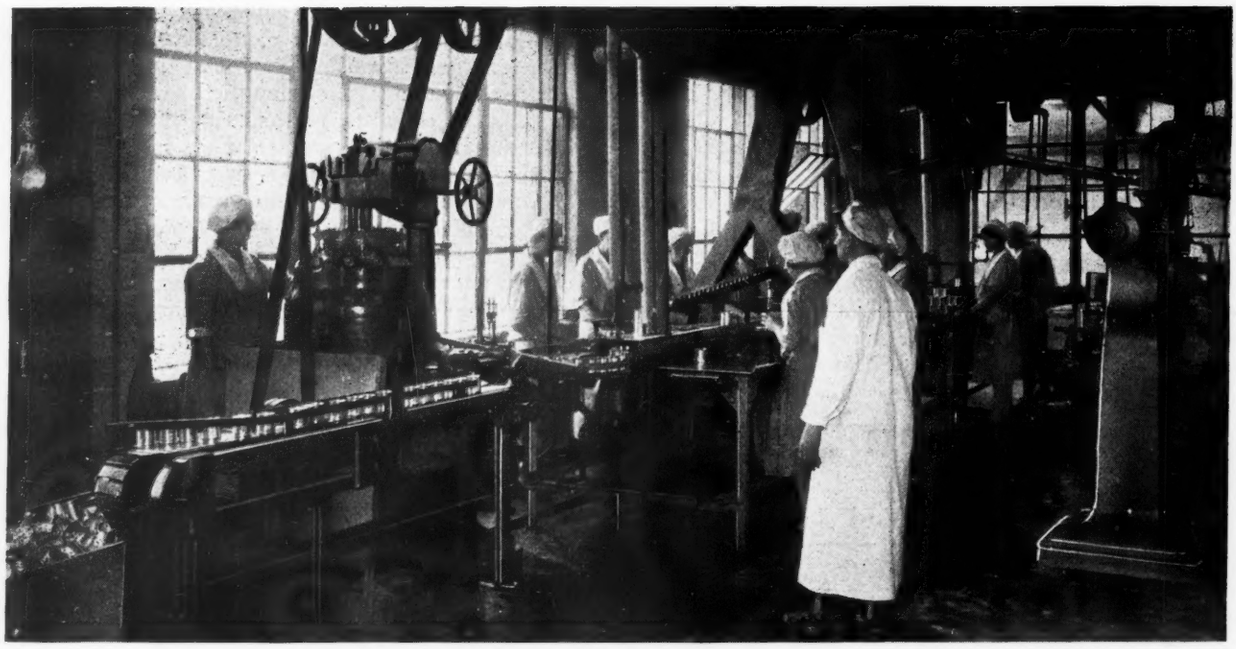
In Budapest, I was particularly impressed with the cereal research institute presided over by Hancozy. This was not only well equipped but seemed to have been inspired by the genius of its director, whose work is perhaps not yet sufficiently appreciated. One could not help being struck by the ingenuity shown in many of the devices seen there.



Experimental bakery conducted in connection with the laboratory of Woodlands, Ltd.

In a survey of this sort there are obviously a number of well-known experimenters left out, but it can be seen that Europe as well as North America has contributed something toward our increasing knowledge of the subject of cereal chemistry. It is unfortunate for European cereal chemists that there is no journal published entirely for the publication of such work, as *Cereal Chemistry* is in the United States. It is possible that this defect will be remedied in the near future. At the same time European cereal chemists generally are under a great obligation to the American Association of Cereal Chemists, whose official journal *Cereal Chemistry* is always open to receive communications of sufficient merit from the whole world.

It was my privilege last year to attend the Annual Convention of the American Association of Cereal Chemists in Minneapolis. It is impossible to overestimate how much this active association has done for the advancement of cereal science all over the world. Its work also has led the way to useful cooperation between American and European chemists. There is no doubt that this pleasing feature will lead in the not distant future to even better results than those already achieved.



Can filling table at the right with chute from cutter on floor above; vacuum sealing machine at left

STRAIGHT-LINE PRODUCTION

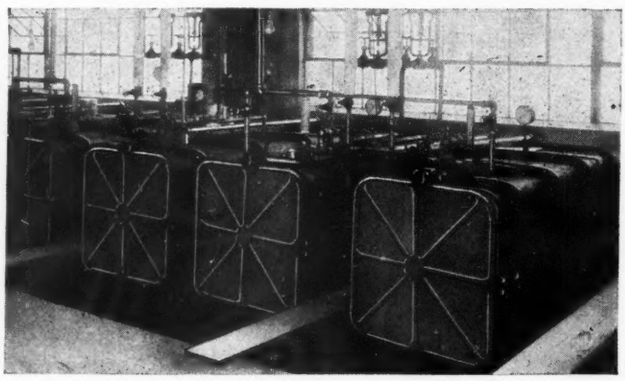
Sausage Making and Canning

By J. B. NEALEY
American Gas Association

MASS production with its straight-line mechanical methods, has invaded the meat packing industry, more especially that of canned meats and sausage. In a modern plant of this kind the raw material passes from one operation to another progressively, with the least amount of handling and in the shortest space of time.

The new plant of the Republic Food Products Company, Chicago, Ill., is a typical example of the most up-to-date methods of preparing and canning meats and making sausage. This concern is housed in a modern four-story and basement concrete and steel building, with ample lighting facilities and provision for thorough ventilation and sanitation. Here is produced a full line of canned meats, including corned beef, roast beef, sliced beef, chili con carne, corned beef hash, sandwich spread, etc., all under the company's own label. Every week more than 500,000 lb. of meats is put up here and over 100,000 lb. of sausage is made and sold under trade-name brands.

Retorts where cans of sausage are sterilized



In the making of the sausage, fresh beef and pork are used. Most of the equipment for this work is located on the fourth floor. The meat is first hashed by motor-driven grinders, and then mixed with salt in motor-driven mixers. Next, the stuffers put it into casings. The stuffers consist of cylindrical steel containers 4 ft. high and 2 ft. in diameter. At the bottom of each, two tubes protrude fitted with casing ends. The meat is forced through the tubes and into the casing by air at 80 lb. pressure. Sheep casings with an average length of 6 ft. are used. After stuffing, they are inspected on separate tables and linked by tying into sausage lengths. The linked sausage lengths are then hung on steel racks with wooden crosspieces, each rack holding about 600 lb. of sausage.

In the smoke house the racks are suspended from an overheal monorail con-

Rack of sausages on monorail entering smoke house

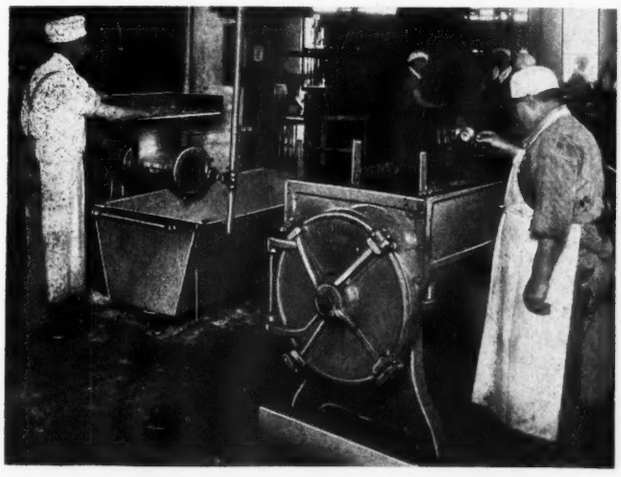
veyor that runs directly into the ovens. There are three of these smoke houses, all fired with gas, of brick construction and insulated with 4 in. of cork on the exposed walls. Each is 10½ ft. deep, 5½ ft. wide, and 11 ft. high, and will hold two racks. Heat is supplied through long-pipe gas burners, close to the bottom, and extending in about half way. Hardwood sawdust is strewn on the floor just below the burners and is agitated by jets of compressed air and burned by the heat from the gas jets. By controlling the agitation the correct volume of smoke is obtained. The temperature of the smoke houses is maintained at approximately 120 deg. F. and the sausages are allowed to remain in contact with the smoke for an hour and a half, a time sufficient to develop the proper flavor.

The racks of sausages are then pulled out and run on the overhead conveyor into a cooker of the same construction and dimensions as the smoke house, but which is steam heated. Here a temperature of 160 deg. F. is maintained and the sausages allowed to cook for about seven minutes. With this time cycle this cooker will handle the entire output of the three smoke houses. After the cooking is completed the steam is turned off and the sausages cooled with cold water from a sprinkler system inside the cooker. They are then chilled by running the racks, still on the overhead conveyor, into a cooler kept at a temperature around 45 deg. F. This unit is 16 ft. deep, 15 ft. wide and 11 ft. high, and will hold fifteen racks at a time. One hour is required for chilling, after which the sausages are cut into correct lengths for canning.

The cutting unit consists of a 5-ft. wide traveling conveyor made up of wooden slats. The slats are hollowed out to receive the sausages and divided every 2½ in. so that the cutters will pass through them. At one end of the conveyor is a steel cylinder on which are mounted ten, circular knife-edged steel cutters 4 in. in diameter. Operators feed the conveyor at one end, while from the other, the cut pieces of sausage drop through a chute to a packing table on the floor below, where they are put into cans.

The packing table is 20 ft. long with a rack, slightly elevated at one end, down the middle, along which empty cans roll in a steady stream. The chute from the floor above divides into four parts so that the cut sausage lengths are distributed to four points on the table. The

Motor-driven sausage grinder at left; mixer at right



Compressed-air sausage-stuffing machine with linking table at right

empty cans are lifted from the basement by a continuous elevated conveyor, and discharged directly onto the rack. On the table, close to the operators, is another conveyor on which are placed the cans filled with sausage. This conveyor runs the length of the table and then loops back, carrying the cans through a small steam exhaust box which vacuumizes the cans at 160 deg. F. The cans then pass into an automatic topper that puts on the covers and crimps them with a watertight seal. This unit handles 80 cans a minute.

The sealed cans are placed in trucks holding several thousand cans each, and removed to the sterilizing room. Two truckloads at a time are sterilized in retorts. After sterilization the cans are cooled with cold water, removed from the retorts and dumped into hoppers which feed them to the floor below, where they are thoroughly dried for labeling by automatic labeling machines. Though many types of canned meat, other than sausage, are manufactured in this plant, they are all handled on the same principles as those just described for the sausage department; that is, large scale production through motorized equipment, monorail conveyors and chutes for moving raw and finished materials and containers, automatic cutters, closing and vacuum machines. Raw material and containers move smoothly from process to process to emerge as a steady stream of finished product

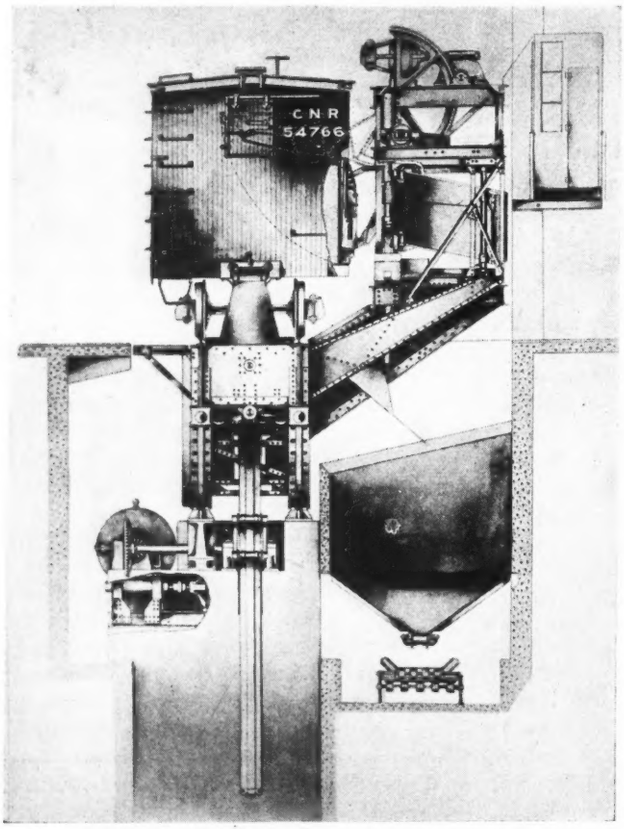
Motor-Driven Car Unloader

Speeds Up Materials Handling

By GRAHAM KEARNEY
Canadian General Electric Company, Montreal

SOME YEARS AGO several motor and control equipments of special nature were installed for the operation of a type of grain car unloader developed and manufactured by the Dominion Bridge Company, Limited. The success of these unloaders was such that last year the Dominion Bridge Company decided to build a total of eleven complete equipments. The unloaders are being installed in connection with grain elevators in Vancouver and Fort William.

Elementally, the operation of unloading a grain car is a simple process. The car is seized by both ends—as one would a cocktail shaker—and up-ended, first one way and then the other, allowing the grain to run out the door at the middle. The equipment required to accomplish this simple result, however, is somewhat elaborate. It consists essentially of a cradle or tilting platform supporting a length of track, sufficient to accommodate one grain car, with means for locking it in position, a device for breaking in the false door in the side of the car, and baffles or vanes to be inserted through the car door for the purpose of deflecting the course of the grain outward as the car is tilted.



Sectional view of automatic box car unloader apparatus

The equipment is electrically driven throughout. When the car is spotted on the center of the cradle, a clamp at each end of the car is raised from the body of the cradle by a 22-hp., 900-r.p.m. motor, and forced against the bumpers, clamping the car securely between them. As any slight overtravel of these clamps would create dangerous pressures and probable breakage, an instantaneous overload relay shuts down the motor as soon as it begins to stall with the closing of the clamps, and a solenoid brake brings the motor to rest and prevents any slacking back.

The car being securely clamped, and the outer door having been opened, the false door, which is lightly nailed from the inside, is forced in by the door opener. This consists of two arms, the lower ends of which rest against the false door, the upper ends being provided with gears and rotated on a shaft supported by a structure on the cradle facing the car door. These arms are rotated by a 22 hp., 900 r.p.m. motor, with solenoid brake.

A certain amount of grain will now run out, but to permit clearing out one end of the car, a baffle or guide is run in through the door at an angle. It is propelled by an 11-hp., 900-r.p.m. motor, also equipped with a solenoid brake. Four end-lock bolts, which have held the cradle in a horizontal position, are now withdrawn by another 11-hp. motor, similar to the baffle motor, and the cradle and car are free to tilt. The cradle-rocking motor, rated 75 hp., 720 r.p.m., mounted in the pit beneath the cradle, then comes into action, tilting the cradle and car endwise and causing the grain to run from the upper end along the baffle and out into a hopper. The car is then righted, a similar baffle is run in from the opposite by another 11-hp. motor, and cradle and car are tilted in the opposite direction, allowing the grain to escape from the other end. When the car has been completely emptied, the cradle is returned to its original level position, the baffle is withdrawn, the end-locks are extended, the bumper clamp is lowered, and the car is ready to be returned to the railway siding.

The equipment, then, consists of: One 22 hp. bumper clamp motor; one 11 hp. end-lock motor; one 22 hp. door-opener motor; one 75 hp. cradle rotating motor; two 11 hp. right and left baffle motors—all with reversing drum switches and resistors; one special reversing and protective panel, inclosed, with contactors and relays; limit switches as described below.

All except the 75-hp. motor are totally inclosed, with ball bearings, 15 minute rated, 550 volts, 60 cycle. The

General view of automatic box car unloader installed

75 hp. motor, which alone is mounted on a stationary foundation, is of the open type, with sleeve bearings.

All of the operations are controlled by one operator in a cab located on a fixed runway alongside the cradle. The probability of serious damage in the event of a wrong sequence of operations necessitates complete interlocking of controls; hence semi-magnetic control is used throughout. The operator's cab contains a reversing drum switch for each motor, the secondary points operating reversing contactors. These contactors, one for each motor, are mounted on a special panel in a steel-inclosed case outside the cab. Overload relays are provided in each motor circuit. Interlocking between the different control circuits is obtained by means of limit switches. A modified limit switch operated by one of the end-lock bolts functions as a limit switch to prevent overtravel in either direction; it also prevents improper operation of the other controls. When the cradle is unlocked (end-locks withdrawn) this limit switch has opened the control circuit of the bumper clamp contactor, so that the car cannot be unclamped unless the cradle is locked in the horizontal position. When the bolts are extended (cradle-locked) the rotating motor is similarly inoperative.

Connected with one of the bumper clamps is a limit switch, which keeps the end-lock motor control circuit open until the bumper clamps have almost closed on the car, preventing the unlocking of the cradle until the car is held safely between the clamps.

The door opener is provided with a limit switch, which prevents overtravel and keeps the control circuit of the bumper clamp and end-lock contactors open unless the door opened is in full out position. A hatchway-type limit switch mounted on the cradle closes the bumper clamp end-lock control circuit only when the cradle is in the level position. Each baffle has a hatchway-type limit switch at each end of its travel, for overtravel protection. The "forward" ones have short circuiting push buttons to permit further travel should occasion require. The baffles also have normally open-door-type limit switches connected in series with the common return of the door-opener limit switch and the cradle-limit switch. These prevent the bumper clamp, end lock and door opener motor from operating unless the baffles are fully withdrawn.

It will thus be seen that the control equipment is practically foolproof. No motor will operate unless all parts of the equipment are in their proper position to permit such operation in safety, so that events can occur only in their proper sequence.

To Improve Fishing Industry

At the first meeting of their recently formed association 690 New Brunswick fishermen decided to ask the Canadian Department of Fisheries for long time loans and to consider mutual insurance. Other objects are to promote scientific methods of handling fish products and to obtain better prices.

MONEL METAL *at Swift's*

By A. E. HANSON
International Nickel Company

Table where sausage casings are cleaned

ALTHOUGH Swift & Company market a very large variety of products, including soaps, cleansers, washing powders, fertilizers, gelatine, glue, oleomargarine, butter, eggs, cheese and poultry, it is for their huge meat production that they are most widely known. The number of animals dressed weekly in their packing plants averages 75,000 cattle and calves, 75,000 sheep and lambs, and 175,000 hogs.

The dressing of these animals is one of the most efficient industrial processes so far developed. The work is carried out at high speed, yet employees do their work in what apparently is a leisurely manner. Swift's production executives insist upon accuracy in each operation rather than speed, finding this policy the one calculated to insure maximum production. The equipment needs of each department are carefully studied, so that the best and most sanitary equipment possible may be installed in the plants of the company. New machinery and devices are tested as soon as they appear and, if economically practicable, are adopted.

To describe the entire production, is beyond the scope of this article, but the efficiency and sanitation in the sausage department are typical of the whole. Casings, after filling, are linked by hand, the work being carried out on wide sausage tables, many of them topped with Monel metal, which was adopted because it is readily kept clean and will stand years of service. The surface of stone tables has been found to chip and crack rather badly, and to wear unevenly, so that stone tables are gradually being replaced by the more durable metal. Sausages, and in fact, many other products, are packed by automatic machinery, much of which has been developed by members of the Swift organization. One of the molds used for packing one-pound "Premium" frankfurters is made of Monel metal, a rather minor use in this department.

Meat and spice pans of Monel metal render a more important service. These pans are some 14 in. in diameter and 5 in. deep and are being used to replace aluminum pans, which get out of shape very quickly and do not last more than six months on the average. These pans must stand up against very hard usage and Monel metal is proving extremely satisfactory in this service. Unfortunately, the life of the Monel metal pans cannot be estimated, as the service period up to the present time has been too short, but it can be stated that after six months the pans are practically as good as new. Liver

Veal loaf pans, lined with paper before being filled with product for subsequent cooking

Table for use in hand linking sausage

cheese pans also are subjected to fairly strenuous service. These were originally made of welded steel, but this material cracked so badly that the service life of the pans was comparatively short. A number of Monel metal pans have been substituted very satisfactorily.

One piece of equipment in the sausage department that is in continuous use is the casing flushing table. One of Monel metal has been in use for three years, replacing a steel table which corroded badly and lasted a bare three months. The Monel metal table is as good as new and apparently will last indefinitely. This table is flushed continuously with a stream of brine used to cleanse the animal casings obtained from Swift & Company's own production. No artificial casings are used as the company produces sufficient to take care of the needs of its sausage department.

Monel metal is used also for lining the troughs of the churns that are used for curing butts and pork tongues. These troughs measure approximately 4x3 ft. and are about 18 in. deep. The service is not particularly severe, and the Monel metal linings, although in use for a long period, are as good as new.

Probably one of the oldest services of Monel metal in the sausage department is for the collars of rocking blocks. Rocking blocks are passing out of use in all plants, so the main interest in this use is largely historical. It is interesting to note, however, that the Monel metal collar is very much the same as on the day it was first made.

Swift & Company are large producers of byproduct glue, which is dried on wire mesh screens. Some twenty years ago many thousands of Monel metal screens were bought for the use of this department and there are still a few of them in service. Most of them lasted fifteen years or more, and when they did fail, it was primarily due to the wooden framework of the screen rather than to the metal. A new process for making glue is now being developed and it seems probable that this type of screen will not be required in future glue production. A comparison of the life of the Monel metal screens with the galvanized screens shows that Monel metal lasted from five to eight times as long as the galvanized metal.

Packaging machinery has been very highly developed by Swift & Company and many operations previously performed by hand are now performed at a much faster rate by automatic machinery. One of the machines used for dividing cheese is fitted with a Monel metal knife in order to avoid possible metallic contamination. It seems probable that Monel metal will find other uses in packaging machinery, as well as elsewhere throughout the establishment, as new devices are developed.

Churn and trough used in one step in the curing process for pork butts and tongues

Thermal Overload Relay

Protects Electric Motors

By H. E. Cobb
Control Engineer
Westinghouse Electric & Manufacturing Company

ALL MOTORS in industrial use have some form of overload protection to limit the temperature of the motor parts in case of abnormal conditions. When a load in excess of normal is required of an electric motor, the current drawn from the line also is in excess of the normal current. Excessive currents in the motor windings bring about excessive temperatures that, if allowed to rise to a limiting value, cause the motor insulating materials to deteriorate rapidly.

It is common practice to consider the motor load current as the criterion of motor temperature. Practically all overload devices are actuated from the motor current and usually are connected in the motor circuit as shown in Fig. 1. In this arrangement for a three-phase A. C. motor, two relays are connected in two leads in series

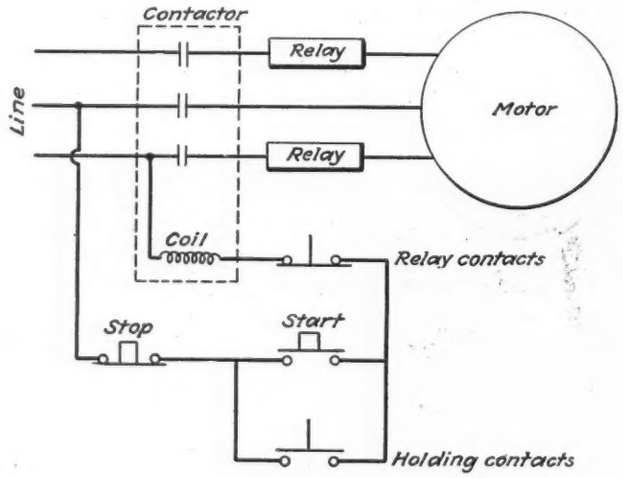


Fig. 1 — The overload relays are placed in the lines leading to the motor. Two relays are required for three-phase A.C. with undergrounded neutral. One is required for two-wire D.C.

with the motor. The same arrangement would apply to a D. C. motor except that relays may be connected in either or both motor leads. Usually the motor is connected to the line through a magnetic contactor that may be opened by the relay. Operation of the relay due to an overload de-energizes the contactor and causes the motor to be disconnected. In some cases the overload relay controls a low-voltage relay that causes the motor to be disconnected from the line.

What should be the characteristics of an ideal, overload relay for the protection of a motor? This question can best be answered after consideration of the characteristics and requirements of the motor which the relay is to protect.

The temperature attained by the motor parts is a function of time and load current, therefore, a protective relay also should operate by a combination of time and current. When a motor starts, the current rises to a peak that is in excess of the normal running current; for example, when squirrel-cage A. C. motors are started directly on line voltage, which is now a common practice, the peak current is about six times the full-load current. The starting current peak usually exists for only a few seconds, depending on the motor, and is then reduced to the normal load value as the motor comes up to speed. Since the high starting current exists for only a short time, the overload protective relay should not open the circuit at this time, as this would interrupt the starting operation of the motor.

It is possible, of course, to set any overload protective relay so that it will not trip out under starting conditions. Consider, for example, an instantaneous trip relay or a dashpot relay that has a relatively short time delay. Suppose such relays are set so as not to trip on six times full-load current, as is required if they are to be in the circuit when a motor is started; then at, say, five times full-load current, or at any normal overload, the motor would have no protection, since its protective relay does not operate at less than 600 per cent overload. At loads greater than its maximum continuous capacity a motor will heat up. The time required to reach a dangerous temperature depends on the load. For example, when a motor carries 15 per cent load, the time required is 30 minutes; 200 per cent load, 9 minutes; 300 per cent load, 3 minutes; 400 per cent load, $1\frac{3}{4}$ minutes; 600 per cent load, $\frac{3}{4}$ minute, etc. Fig. 2-A shows this relation as a curve.

The curve will vary with the type of motor, the ambient temperature, and the condition of the motor when the overload occurs. Thus it can be seen that, if a protective relay operates instantaneously as a function of current only and is set to allow the motor to start, there is no protection against sustained overloads. At any overload the ideal protective relay should operate in a shorter time than that shown above for such overload. In other words, the relay should operate before the motor parts reach a dangerous temperature.

There is still another requirement for the ideal relay. It is sometimes necessary for motors to carry overloads, though, of course, they must be within the time limits just given. A protective relay must not only operate before the motor reaches a dangerous temperature but also must not operate before a reasonable amount of the motor overload capacity can be utilized if desired. As shown by the motor characteristic (Fig. 2-A), the motor can run at full load indefinitely; at 200 per cent the motor can run for 9 minutes before reaching the limiting temperature and so on for other overloads. Since it is desirable to use some of this capacity the relay should not operate until a reasonable time has

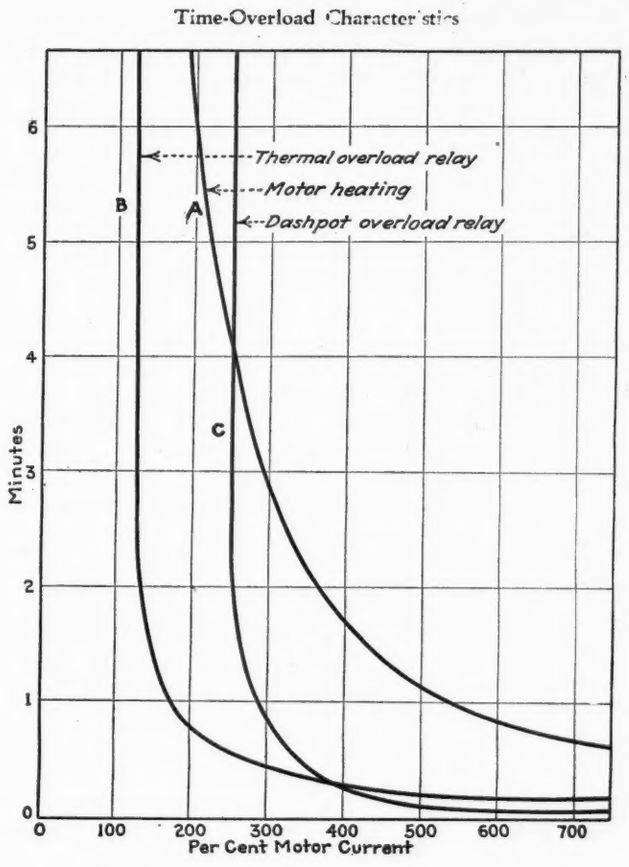


Fig. 2 — Overload characteristics of thermal (A) and dashpot (C) relays compared as to their suitability in the overload protection of a motor: characteristic (A)

elapsed, which should, of course, depend on the overload just as the motor heating time depends on the overload. Since motors vary widely in their heating characteristics, the ideal relay should protect the motor with the shortest time characteristic to make sure that it will protect all motors with which the relay may be used. Therefore, the relay characteristic should fall well under the average motor characteristic (Fig. 2-A).

Since the characteristic heating curve, A (Fig. 2), of the motor represents a thermal relation, it is reasonable to expect that a similar curve could be obtained from a relay which is thermally operated. Curve *B* shows the characteristic of the type TA overload relay. The curve falls below the motor curve sufficiently to insure protection at all loads and yet allow a reasonable amount of overload to be utilized. For example, at 250 per cent load the relay will not operate until after about 1 minute.

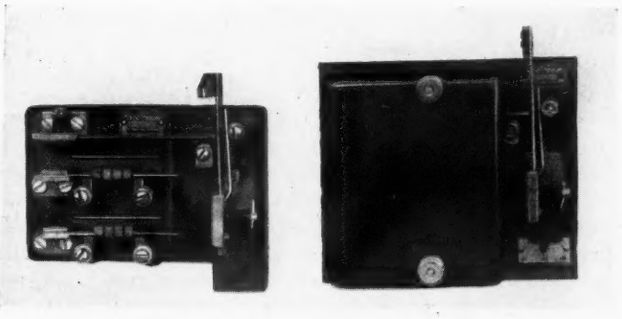


Fig. 3 — TA thermal overload relays. Without cover for cabinet use. With cover for open panel mounting.

This is well within the safe limit, since a motor of the characteristic represented here will stand at least 4 minutes of this load.

Curve *C* is the characteristic of a dashpot relay set to give approximately 5 seconds at 600 per cent full-load current, or just enough time for the motor to start without tripping the relay. Note that the type TA relay gives 12 seconds time at this load. The dashpot relay when so set will not trip out on less than 250 per cent load current. In other words, the motor gets no protection on loads less than 250 per cent. Above 300 per cent the time allowed by the dashpot relay is considerably shorter than that obtained on the thermal relay. Thus when the dashpot relay is used, protection is not given under some conditions and overload capacity cannot be used under other conditions.

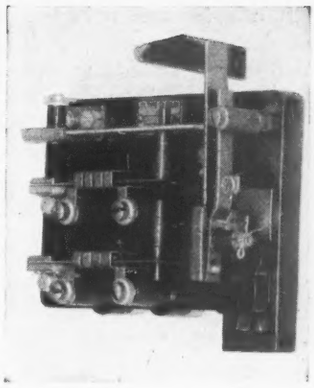


Fig. 4 — Heaters which are interchangeable are placed astraddle the bimetal.

The foregoing discussion applies to relays suitable for the protection of motors started by connecting them directly to the power supply without a starting step. It is now known to be convenient and economical to start them in this manner, especially since motors are now built to stand the shock of "line starting." Since full-voltage starting has become common, the thermal overload relay has become desirable if not absolutely necessary in place of the old types of instantaneous or short time dashpot relays that were used when the overload relay was shorted out during starting on multi-point starter. Of course, it is still necessary to use multi-point starting where conditions demand a high starting torque, as in the case of the auto-starter and the wound-rotor motor starter. In such cases the thermal relay still shows an advantage because it allows utilization of the motor overload capacity, especially in starting.

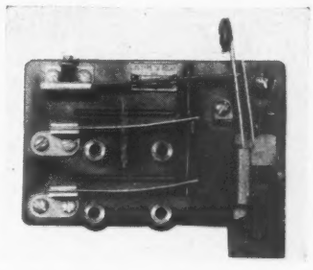


Fig. 5 — Position of bimetal and latch when in tripped position. (Heaters removed.)

On the Westinghouse type TA thermal relay, heat is accumulated in a resistor or heater that carries the motor current, and a bimetal strip placed near the heater. The temperature of the heater, which is governed by the motor current, causes the bimetal strip to curl or bend and thus produce the mechanical work that operates the relay. (*Journal of the Optical Society of America and Review of Scientific Instruments*, Vol. II, July-Dec., 1925; also *The Electric Journal*, June, 1928.) On this device a bimetal is used that operates at a relatively high temperature (Approximately 150 deg. C.) Operation at this temperature is desirable in order to minimize the effect of the surrounding air temperature on the performance of the relay.

It is true, of course, that a low air temperature will allow both the motor and relay to carry overloads with-

out heating, and a high temperature will limit the load of both. However, it is a general practice to locate the motor starter at some position remote from the motor, so that entirely different air temperatures may exist between the two positions. In such cases the best that can be done is to have the overload relay operate as nearly independent of air temperature as is possible.

Fig. 3 shows the finished relay as built for different applications. There are two heater-bimetal units that are independent electrically but coupled mechanically, so that either or both units can operate a single-control contact. The bimetal strip is mounted with one end fixed and the other engaged with a push rod. The heater has the appearance of a grid resistor; is shaped so as to straddle the bimetal strip (Fig. 4), and is mounted at each end on connection studs. The push rod bears against a latch hinged at one end; the other end slides along the contact arm and approaches a slot in the arm when caused to move by the bimetal and push rod. The contact arm and finger are wedged between the latch and a stationary contact post.

When the heaters carry their continuous load current, the bending of the bimetal is sufficient to cause only a small travel of the latch toward the slot, but, if the current becomes greater than normal, the bimetal becomes heated and bends so as to raise the latch until its end drops into the slotted contact arm. This allows the arm and finger to snap to the left, separating the contact finger and contact post by pressure from a spring. Fig. 5 shows the relay just as this operation has occurred (heaters removed).

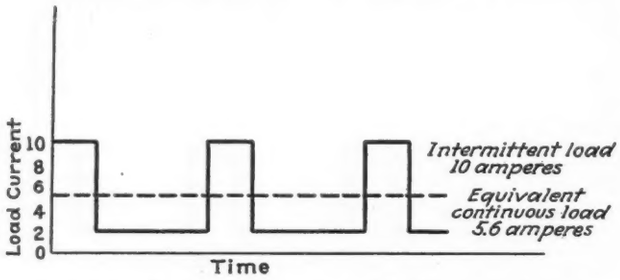


Fig. 7 — Intermittent and equivalent continuous currents which are used to obtain relay rating.

After the relay has tripped due to an overload, the contacts may be reclosed manually by pushing the contact arm to the right sufficient to allow on the latch to drop from the slot. The latch cannot be reset, however, until the bimetal has cooled and straightened enough to allow the latch to bear below the slot in the contact arm. The short time required after an overload trip is not objectionable and may even be desirable, since some time should be spent in locating and correcting the conditions that caused the overload. An index lever is provided which may be moved to raise or lower the contact arms and thereby decrease or increase the bimetal deflection necessary to cause the latch to drop into the slot. This provides a way of changing the rating of the relay or changing the current necessary to trip it. The rating can be varied by this means, 20 per cent above or below the normal 100 per cent rating.

The thermal relay characteristic curve Fig. 2-B) becomes straight at 115 per cent motor load where the time of trip is about 15 minutes. The current which will trip the relay in this time is known as the ultimate tripping current and is the basis of the relay rating. For example, as the curves of Fig. 2 are plotted, if the motor full-load current is 10 amp. the relay rating is 11.5 amp. In this case a relay is used that has a rating 15 per cent greater than the motor to make sure that the motor will be able to carry full load indefinitely without operating the relay. The relay characteristic shown is practically constant for all ratings of the relay. Figs. 4 and 5 show the relay with and without heaters respectively.

The temperature required for operation is fixed and

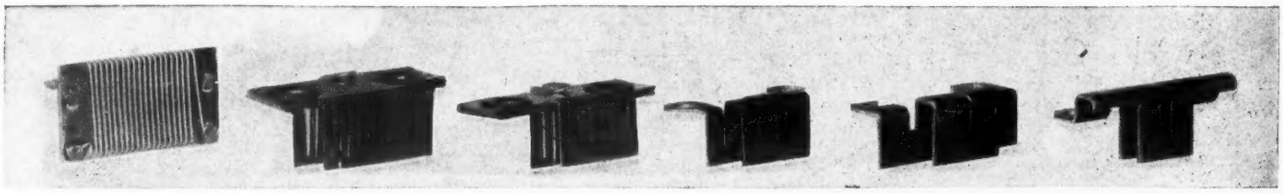


Fig. 6 — Styles of heaters used to give ratings of 1 to 100 amp.

in order to produce the temperature with different currents flowing it is necessary that the heaters have different resistances. Fig. 6 shows types of heaters with ratings from 1 to 100 amp. all of which are suitable for a common mounting on the relay. Each heater has stamped on it its rating in amperes, or ultimate tripping current when mounted on a relay with the calibrating lever set on center, or 100 per cent. The heaters are made from a heat-resisting nickel-chromium alloy. In most cases, where the motor is to carry full load continuously, the thermal overload relay should carry a heater having a rating from 15 per cent to 25 per cent above the full-load current of the motor.

Suppose it is desirable to use the thermal relay to protect an intermittently rated motor. For example, a motor has the load cycle shown in Fig. 7; that is, the motor draws 10 amp. for 20 seconds; then 2 amp. for 50 seconds but has no load; then 10 amp. for 20 seconds, etc. Such a load cycle produces a temperature rise in the motor that may also be produced by an equivalent continuous current, and this is the basis of a correct relay rating to give protection to the motor. The equivalent current is equal to the square root of the sum of the squares of the current values of the cycle, taking into account the division of time between them. Thus, for the cycle in Fig. 7,

$$\sqrt{\frac{10^2\times 20+2^2\times 50}{20+50}}=5.5 \text{ (approx.)}$$

In other words, a load of 5.5 amp. continuously will produce the same temperature rise as 10 amp. for 20 seconds followed by 2 amp. for 50 seconds, etc. Such calculation is accurate enough to determine relay ratings. The relay should have a rating from 15 to 25 per cent above the equivalent continuous motor current, or a rating of, say, 6.5 amp. The above rule could not be used, of course, if the cooling—or heating—intervals were long enough to allow the motor to reach a constant temperature during the interval.

Depreciation Should Reflect All Costs

. . . Replacement as Well as Original

By ERNEST F. DUBRUL

Fellow of the Institute of Management,
General Manager, National Machine Tool Builders' Association

THERE is much argument in accounting and engineering circles in connection with this thing called depreciation. Many writers and speakers are discussing the point as to whether depreciation should be taken from present reproduction cost, or from cost of acquisition. Careful analysis of various statements on these points shows great lack of clear definition of terms on the one hand, and on the other a mentally confused use of the same words in entirely different senses by the same writer or speaker.

Some distinguished professors of accounting, and eminent partners of important accounting firms show confusion of thought and expression on this subject. This confusion has such an important reflex action on business that there is need to worry about it. Some so-called principles of accounting are enunciated by writers whose confused thoughts are offered as guides to business men.

For instance, one professor says: "It should first be stated that many of the disputes about the content of overhead arise from confusing the economic with the accounting definitions of cost." A partner of a large accounting firm says that it will not do to mix accounting with economics. This thought is repeated in various forms by other writers. But the sensible business man understands that economics is simply the science of business principles, under a schoolbook name. The business man, as such, is engaged solely in practicing the economics that the economist writes about.

THE essential function of accounting in the business world is to give the business man certain business or economic information. Therefore, in spite of the ideas of accountants and professors of accounting, the accounting function is a part of the economic structure; accounting is a part of economics, and its methods can and should be squared with economic facts.

Dr. E. A. Saliers, in his book, "Depreciation—Principles and Application," says:

> "Viewed from the financial side, capital invested in plant has two aspects, cost and value. Accounting deals with cost rather than value."
>
> "Practically all accounting for wealth invested in fixed assets is on a cost basis and bears no relation to present exchange value or to replacement cost."
>
> "Depreciation from the accounting point of view deals strictly with the replacement of wasting assets at cost."

Now the business man has to deal with both cost and value, and if his accounting department is to deal with only one of these essential aspects, then the business man must establish some other staff, separate from his present accounting staff, that will deal with values; because the manager must deal with them in his managerial function.

Any thoughtful manager will say that this alternative is ridiculous. There is no reason why the same accounting staff should not deal with both cost and values. It is purely an accounting tradition, based on confused thought that seeks to confine depreciation accounting solely to the cost basis. That sort of accounting leaves the executive to struggle hopelessly with problems of value that can and must be co-ordinated with the cost aspect. In a large number of cases, the value aspect is much the more important side of the problem. Why expect the business man to have one staff of accountants dealing solely with cost; another staff of super-accountants dealing solely with value; and the executive as a super-super-accountant, co-ordinating the two?

Since values of fixed assets have a habit of changing, original costs seldom correspond with values for very long after assets are bought. Costs are historical and static, whereas values are current and dynamic. A record of the number of dollars paid for an asset is simply a bedtime story of what happened "once upon a time." But a material change in the value of that asset is a current fact of extreme importance.

AN illustration of the necessity for distinguishing between the financial effects of the changing purchasing power of money and the physical effects of deterioration came to my notice recently. A company had two return-tubular boilers installed in 1908. Due to a bad water condition, the boilers deteriorated in twenty years so that they were condemned by the boiler inspector and ordered replaced in 1928. Here is a clear case of complete physical deterioration. The scrap value of the boilers did not equal the cost of taking them out. So there was also a complete loss of value. The company in question had estimated a life of twenty years for these boilers, so that from the engineering side their estimate was close to the physical facts. The company's accountant had reserved and charged the cost of the boilers 5 per cent of the original cost each year, so that, according to all the canons of "conservative" accounting, the company's "capital" was intact.

But the dollar's habit of changing in purchasing power injected another financial condition into the executive's problem. The original boilers had cost $2,800, in place. Two exact duplicates twenty years afterwards cost $6,800. When the company paid the bill for the new boilers, the accountant set up $6,800 in his boiler accountant, and took $2,800 out of his depreciation reserve. By all the traditions of "conservative" accounting, that company had $4,000 of surplus on the books, and yet it had no more boiler property than it had

originally. The only surplus existing anywhere was a mere figure on the accountant's book. This $4,000 was a profit only in the eyes of the accountant. From the point of view of the economist or the business man, it was an actual cost that had not been charged to cost during the life of the boilers.

That accountant followed Dr. Saliers, who says:

> "Accounting deals with cost rather than value, and replacement allowances are made on the basis of cost of the unit to be replaced, not on the basis of its exchange value or on the cost of replacement."

But this policy is not reconcilable with the two following statements of the same author, who says:

> "When depreciation costs are not included, spendthrift consumption is encouraged because costs are understated and profits overstated."
>
> "Ordinarily the capitalization of depreciation arising out of wear and tear is erroneous, for this results in meeting its cost through issuance of new securities, a mistake not infrequently made."

Certainly in the above illustration, the financial effect of this deterioration was not reflected in the accounts which were kept on the cost of acquisition basis. If the company had paid out this accounting surplus in dividends, it would have had to meet the additional cost of replacement through issuance of new securities, which Dr. Saliers points out to be a mistake.

ANOTHER example of confused thought expressed by Dr. Saliers occurs in the following discussion of unit depreciation:

> "Machines embody in themselves utility created by their manufacturers. By use, this is exhausted and becomes an element of cost of the commodities it produces. Thus in the words of Leake, the capital outlay of the machine expires, and to avoid a continuous expiration of capital outlay on the entire plant, the machines, rolling stock, power producing and distributing systems, etc., which comprise plant, must be replaced when they become ineffective. When a machine which has been transferring its utility into commodities for twenty years collapses, it should not be replaced from current revenue, unless replacements of such kind are scattered evenly enough over monthly intervals, as not to make such replacements an undue burden upon the current month."

In this paragraph, when Dr. Saliers accepts Leake's conception of depreciation as expiration of capital outlay, he mentally confuses the physical fact of deterioration with the financial effect which his depreciation account is trying to picture. It is the utility that expired, but the financial effect of this expiration may be either greater or less than the money outlay that was paid for the utility.

If boilers had been bought at the peak of the price movement that occurred in 1864, and were replaced because worn out, at the very bottom of the price decline that ended in 1896, the capital outlay for their replacement would have been only about one-third of the original outlay. Assuming that funds had been set aside each year for 32 years, which at compound interest exactly equaled the original cost, the company would have had much more money on hand than would be necessary to pay for the replacement. Yet the books would not show this to be surplus money, if depreciation were figured on the basis of original cost. Charging this excess to cost would have deceived the executive as to the true depreciation element in his cost of production for the whole 32 years. The books would have been actually understating his real money profit and overstating his cost. They would have reflected in costs much more than the financial effect of the loss of utility that the boilers had been transferring to the goods produced in this period.

If the new boilers were treated in the very same way from 1896 to 1920 the books would have deceived the executive in exactly the opposite fashion. They would have shown a surplus profit where no surplus of property existed. He would have believed that he had a lower cost of production than a competitor who had bought the same boilers later at a higher price.

Because of these changes in the purchasing power of money, it is necessary to set out both the cost and value aspects which Dr. Saliers recognizes to exist in capital invested when viewed from the financial side. Only in this way can the executive get a complete picture of the business facts that he must wrestle with. Why should his accountant try to deprive him of this very important picture by insisting that accounting for fixed property should deal only with cost facts, to the neglect of value facts? And when accountants do only that, how can they say that their replacement allowances are intended to provide funds with which to replace the equipment? Are they not merely providing funds to equal the original outlay and neglecting entirely the more important thing of getting the money needed to replace the property?

AS a recent and vivid example of the necessity of using value accounts rather than cost of acquisition, one need only consider the situation in which the executive of a German or French business house found himself during the worst periods of currency inflation in those countries. During that inflation period, what good would it have done a German executive to figure depreciation on the original cost of assets, acquired when marks were worth four to the dollar? At the height of the inflation, the German mark had depreciated to such a point that it took the fantastic sum of 250 billion marks to equal the purchasing power of an American dollar. In France the legal franc has now only about one-sixth of the gold value of the old franc, yet both are called by the same name. Even though the old franc itself had not lost any of its pre-war purchasing power, how can accounting for original costs in pre-war francs help the French executive when the present-day franc has only one-twelfth of the purchasing power of the pre-war franc?

The inflation of these two currencies produced financial effects on German and French business concerns that did not differ at all in principle from the financial effects produced by the changing purchasing power of the dollar on American concerns. The only difference was in the greater degree of need in accounting for the effects produced.

Even "conservative" accounting would be horrified at a shortage of 50 per cent in the bank account. Why, then, neglect the business fact that at least 50 per cent real loss in the depreciation account has occurred since 1913 because prices of industrial equipment, buildings, etc., are at least 100 per cent higher than pre-war? Do not these illustrations, taken from actual business experience, demonstrate that business men need something more than they have been getting in the way of accounting service? Do they not show that executives need something better to guide their policy as to replacement, to make sure that they have not omitted a very essential element of depreciation in their cost sheets, that they have charged on these cost sheets the amount that they must collect from their customers if their plant is to be replaced?

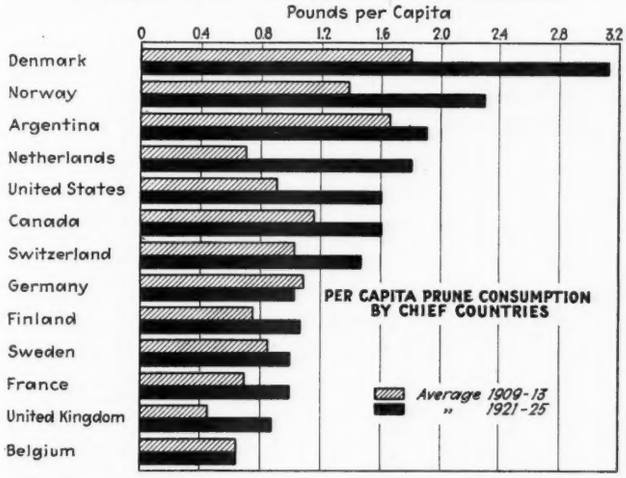
Dried-Fruit Statistics Foreshadow Low Prices

By S. W. SHEAR
Division of Agricultural Economics, University of California, Berkeley

NOTHING IS MORE SYMBOLIC of California agriculture than the overflowing cornucopia of fruits, vegetables, and nuts. The state has the well-deserved reputation of being the one most important contributor not only to our national fruit basket, but to the fruit baskets of many nations. In foreign countries California dried and canned fruits are particularly well known, not only because of the enormous quantities consumed abroad, but also because of their splendid reputation for keeping quality, flavor, and dependable pack.

Fruits, when dried, are in their most economical form for transporting long distances. With her wonderful climate for sun drying, it is quite obvious why the dried-fruit industry of California has developed to such a tremendous size. Because of their quality and the low price compared with other fruit, the dried fruits of California appeal to consumers the world over. The expansion of both production and exports has been phenomenal since pre-war days. During the last five years the state production has averaged nearly half a million tons of dried fruit, approximately 40 per cent of which has been exported to foreign markets. The vital dependence of our dried-fruit market upon housewives of other lands makes the consumption of dried fruits throughout the world of the greatest interest to everyone in this country who depends in any degree upon the industry for a living.

Per-Capita Prune Consumption by Chief Countries



Northwestern Europe and Argentina have the largest per capita consumption of prunes outside of North America

Because of increased world production—much of which has come from California—and low prices, both the total and the per-capita consumption of dried fruits has substantially increased in most of the chief dried-fruit consuming countries since pre-war days. Our own national consumption of dried fruits during recent years has averaged 6.7 lb. per capita, compared with about 4.3 lb. during the period 1910-1914—an increase of over 50 per cent. Table I shows that prunes constituted nearly 35 per cent of our national production and 24 per cent of our consumption of dried fruits during the period 1921-1925. Nearly 48 per cent of our consumption of dried fruits consisted of raisins. Imports swell our consumption of dried fruits other than prunes and raisins to such an extent that we consume a total of these other dried fruits—chiefly figs, dates, and peaches—amounting to about 23 per cent of all dried fruits, or approximately the same proportion as prunes. During the years 1910-1914, however, prunes constituted only about 21 per cent of our total dried-fruit consumption, raisins 35 per cent, and all other dried fruits nearly 44 per cent.

Comparison With Foreign Countries

The average per-capita consumption of dried fruits in the United States during the years 1921-1925 was lower than that of the Netherlands (9.1), of Canada (8.1), of the United Kingdom (7.3), and of Switzerland (11.0), and slightly higher than that of Denmark (6.2). It was, however, considerably higher than the per-capita consumption of any other important dried-fruit consuming country of Europe except Germany. Germany usually consumes annually between 6 and 7 lb., about 45 per cent of which are prunes. The average number of pounds of dried fruit consumed per capita in other important European markets during the period 1921-1925 was as follows: Norway, 4.7; Belgium, 3.3; Switzerland, 3.0; Sweden, 2.8; Finland, 2.6; and France, 2.1.

The per-capita consumption of dried fruits in the United States of about 4.3 lb. before the war was lower than that of the Netherlands (8.6), of the United Kingdom (6.6), of Canada (6.3), of Denmark (4.8), and also of New Zealand (11.5). The principal importing countries whose consumption fell below our pre-war average are Belgium (4.0), Norway (3.4), Germany (3.2), Switzerland (2.5), Sweden (2.3), Finland (2.1), and France (1.9).

Foreign Prune Consumption

Both the total and the per-capita consumption of dried prunes has substantially increased in nearly all of the chief prune-consuming countries since pre-war years. Comparison of averages for the pre-war years 1909-1913 and for the post-war years 1921-1925, as compiled in the accompanying table, show these increases clearly and also the relative importance of these markets. Germany is the only important prune-producing country whose total

consumption of prunes has averaged lower in recent years than before the war. In two years since the war, however, German dried-prune imports (net) have been larger than the pre-war average, and it seems probable that lower average post-war consumption is attributable largely to temporary reduction in the purchasing power of the Germans, who, in the past, have normally provided one of the best markets for prunes.

Domestic Prune Consumption

Our export trade in prunes during the period 1909-1913 accounted for 48 per cent of our national production, a larger percentage than the average of recent years. In spite of the noticeable pre-war increase in our production, which began about 1909, exports were heavy enough in the years 1909-1913 to reduce our per-capita consumption to about 0.9 lb., the lowest five-year average for 30 years. The increased volume of our exports, however, may be attributed to the decline in European production. During the period 1909-1913 European production of prunes was the smallest of any five years in the last three decades. There is little likelihood that European production will average much lower for some time than it has done during the last four or five years. We cannot, therefore, expect any great expansion of foreign demand for our prunes on the average during the next few years on this score alone.

Consumption of dried prunes in the United States has increased since the decade before the war from about 1.0 lb. per capita to 1.6 lb. during the five years 1921-1925. With the prospects of heavy production in this country during the next few years and no decrease in foreign production and exports, our domestic consumption of prunes will continue to be large, unless something unexpected happens. The outlook for large average crops of prunes and of many other dried fruits and fresh and canned fruits indicates that the level of fruit prices in general during the next few years is likely to be low.

When many kinds of fruits are available at low prices, as has been the case in recent years and as possibly may be the case for several years to come, competition among them for a larger place in the consumer's diet is keen.

Table I—Dried Fruits: United States Production, Foreign Trade, and Consumption, Average 1921-1925

	Production		Exports		Imports		Consumption		
Kind of Fruit	Tons	Per Cent	Tons	Per Cent	Tons	Per Cent	Tons	Per Cent	Pounds Per Capita
Rasins	211,700	48.4	42,283	31.0	5,944	8.9	175,361	47.8	3.2
Currants	.....	....	.....	....	13,010	19.4	13,010	3.5	0.2
Prunes	152,150	34.9	63,865	46.8	....	....	88,285	24.1	1.6
Figs	9,635	2.2	.....	....	19,489	29.1	29,124	7.9	0.5
Dates	500	0.1	.....	....	28,619	42.6	29,119	7.9	0.5
Peaches	23,140	5.3	3,428	2.5	....	....	19,712	5.4	0.4
Apricots	18,300	4.2	10,222	7.5	....	....	8,078	2.2	0.1
Apples	(a) 15,000	3.5	10,652	7.8	....	....	4,348	1.2	0.1
Other fruits	(b) 6,000	1.4	6,000	4.4	....	....	.....	....	...
Totals	436,425	100.0	136,450	100.0	67,062	100.0	367,037	100.0	6.7

(a) Estimated; does not include farm production. A total of over 20,000 tons of dried apples was probably produced in the United States during this period.
(b) Includes 3,000 short tons of dried pears.

Source of Data—

Based on: Wheeler, L. A., International Trade in Dried Fruit; United States Bureau, Foreign and Domestic Commerce, Trade Promotion Series 44:2. 1927.

Table II—Dried-Prune Consumption by Chief Countries, Averages 1909-1913 and 1921-1925

	Total Consumption			Per-Capita Consumption		
Countries	1909–13 Average, Thousands of Pounds	1921–25 Average, Thousands of Pounds	Per Cent Change	1909–13 Average, Pounds	1921–25 Average, Pounds	Per Cent Change
United States	86,800	177,000	+104	0.9	1.6	+ 78
Germany	70,290	63,000	— 10	1.1	1.0	— 5
United Kingdom	20,357	41,277	+103	0.5	0.9	+ 96
France	28,347	38,478	+ 36	0.7	1.0	+ 43
Poland	.....	15,800	.....	...	0.6	.....
Canada	10,386	14,325	+ 38	1.2	1.6	+ 38
Netherlands	4,221	13,018	+208	0.7	1.8	+157
Denmark	5,039	10,035	+ 99	1.8	3.1	+ 73
Sweden	4,859	5,933	+ 22	0.9	1.0	+ 18
Switzerland	3,821	5,778	+ 51	1.0	1.5	+ 43
Norway	3,314	5,958	+ 80	1.4	2.3	+ 66
Belgium	4,780	4,973	+ 4	0.6	0.6	0
Finland	2,408	3,722	+ 55	0.8	1.1	+ 41
New Zeland	900	1,384	+ 54	0.9	0.9	0
Argentina	1,244	1,693	+ 36	1.7	1.9	+ 15

Source of Data—

Data are approximate net imports by calendar years compiled from: Wheeler, L. A., International Trade in Dried Fruit; United States Bureau Foreign and Domestic Commerce, Trade Promotion Series 44:52-55, 97-113; 1927; with certain exceptions.

The limited capacity of the consumer's stomach means that if he eats more of one fruit he will probably eat correspondingly less of others, unless he reduces his consumption of foods of essentially different sort, such, for example, as vegetables, cereals, or meats.

National prodution of many fruits, several of which compete with prunes, to some extent at least, has increased rapidly in the last decade, making it difficult to market many kinds of fruit at satisfactory prices in years when weather conditions have been favorable for good yields of fruit in general. The California output of dried fruits has more than doubled since the pre-war period, 1910-1914, and may continue to expand until 1930. During the same period the national canned-fruit pack, including Hawaiian pineapples, has multiplied by three and promises to grow still further. The national output of fruits that are consumed in fresh form, such as oranges, grapes, peaches, pears, and cantaloupes, has likewise grown rapidly since pre-war days. Apparently for several years there will be no abatement in the keen competition that prunes will normally meet from the plentiful and low-priced fruit which will probably be placed upon the market.

If the large production of prunes forecast actually matures and reaches the market during the next few years, world consumption will have to increase appreciably. Prices, therefore, will have to be very low to induce consumers to use all the available supply or else growers, selling agencies, and others dependent upon the industry for a living will have to unite in a determined effort to put across an effective remedial program. Even to maintain the average price of the last few years in the face of increasing production of prunes and continued large outputs of other fruits will require most extraordinary effort to widen the demand for our prunes both here and abroad.

For help in providing many statistical data used in this article the author is greatly indebted to Mr. L. A. Wheeler, agricultural economist in the division of historical and statistical research of the United States Bureau of Agricultural Economics at Washington, D. C. His study of International Trade in Dried Fruit, published by the United States Bureau of Foreign and Domestic Commerce, in 1927, as Trade Promotion Series No. 44, has been freely drawn upon for foreign statistics. Numerous other sources have also been utilized.

Harmless Bacteria in Water Supply Produce Surface Flavor in Butter

By D. B. SHUTT

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SPOILAGE is the bugbear of the butter industry, and to overcome it the butter maker takes advantage of every suggestion that may have a bearing on the keeping quality of his product. The cream is carefully selected, graded, and pasteurized; the various utensils are subjected to careful washing and sterilization; every factor that may have a bearing on the flavor is watched. Despite the great care that is taken, however, and the fact that the average modern creamery is in as sanitary a condition as it is possible to make it, spoilage has been known to crop up in the finished butter from time to time.

The most important form of spoilage goes under the name of surface flavor. In practically all outbreaks investigated, the original cream has been of the best, and every known care has been taken to insure a perfect product. The butter makers have laid the blame on improper storage facilities and many other factors.

The flavor is peculiar, strongly resembling the odor of stagnant water or old sewage. It appears first on the surface of the butter, and in time penetrates throughout the mass. The period of time necessary for the first appearance varies from a few days to a couple of weeks. The defect is a serious one, and the economic loss is great. In bad outbreaks the value of the butter is greatly reduced—to the extent of being unfit for sale in some instances.

The problem of the Canadian butter maker in the disposal of his product differs from U. S. experience. The Canadian creameries make the bulk of their butter in the warm seasons of the year and only a comparatively small quantity in the winter. Large cities are not numerous, and much of the butter must be placed in storage until it is required. In recent years there has been a growing demand for a low-acid butter, which is peculiarly subject to off-flavors if contaminated with bacteria of the kind that act on proteins rather than carbohydrates. The fact that the main output of Canadian butter is made from cream of approximately 0.25 per cent acid gives us a final product of a much lower acidity, which in some cases is almost neutral.

The American butter maker, on the other hand, is not faced with so short a season. In some localities he can produce butter the year 'round. Cities and towns are more abundant, and in some large sections of the country the demand is keen. Large stocks of butter in storage are not so much of a necessity. The public demand for a butter with a higher acidity is also more pronounced, and the higher acidity tends to hold any putrefactive bacteria in check.

Recent investigations by the writer of the cause and source of surface flavor point directly to the water used for washing the butter. Dairy plants in general must have a liberal supply of water. It is used for flushing floors, cleaning utensils, producing steam; and in creameries large quantities are used daily for the washing of butter. The law permits the incorporation of amounts of water up to 16 per cent in the finished butter; and every butter maker may be expected to come as close to the limit as he dares. If the water supply carries with it large numbers of bacteria likely to act upon the butter the danger of adding them to the product is apparent.

Owing to the fact that water is colorless and has no odor, and because in many municipalities the water supplies are carefully guarded by the health authorities, apathy has arisen as to possible contamination of the water with forms of bacteria other than those likely to cause ill health. The health authorities, and in fact all laboratories which analyze water for impurities, follow definite standard methods and base their reports on the presence or absence of certain intestinal bacteria in the water. However, water supply which is safe for human consumption is not necessarily fit for washing butter. In fact, the municipal supplies of several creameries investigated by the writer were found to be badly contaminated with bacteria of non-intestinal varieties, although free from intestinal pollution. Large numbers of so-called harmless and easily overlooked bacteria of the species *Pseudomonas fluorescens* were present. These, when inoculated into sterile butter, gave the typical surface flavor.

OFF-QUALITY BUTTER *was found to be caused by the presence of a bacterium,* **Pseudomonas fluorescens,*** *in the water supply. This organism, although harmless from the health standpoint, constituted a distinct industrial hazard, and caused a great deal of financial loss. By eliminating the contamination, the spoilage was completely stopped.*

Pasteurization Usually Prevents Surface Flavor

Investigations into the cause and source of surface flavor have incriminated the water supplies in every instance, and only by pasteurization of the water or the securing of a known pure supply has the flavor been stamped out. The following experiences were obtained during the investigations and are quoted from a paper on the subject printed in *Scientific Agriculture,* Vol. 9, page 316, 1929.

Creamery A was troubled with surface flavor periodically. The manager suspected the water supply and boiled the wash water for a time, with satisfactory results. Samples of the water were analyzed and found to be badly contaminated. A new well was bored, and no further surface flavor appeared.

Creamery B was dependent upon a shallow well that was evidently fed from a pond of stagnant water in the vicinity. After a deep well had been bored and connected up, the trouble stopped.

Creamery C obtained its water from a shallow well beside a small stream. The surrounding land was polluted with seepage from a near-by latrine and from hogs. With the sinking of a new well the flavor of the butter improved immediately.

Creamery D was dependent on the town water supply, which was found to be contaminated with *Pseudomonas fluorescens,* but not with intestinal bacteria. The water was safe from a public health standpoint. The suggestion was made to pasteurize and cool the wash water. It was finally found that the temperature of 190 deg. F. for 10 min. was necessary to kill the organisms, for 170 deg. and 180 deg. F. failed to accomplish this end. A marked improvement in flavor followed this treatment.

Creamery E at one time had been a cheese factory. The waste material had been allowed to pollute the surface of the surrounding land for many years. The original well, located at the rear of the creamery and close to it, was only 13 ft. deep. Surface flavor in the butter was the rule rather than the exception, and analysis of the water proved it to be grossly contaminated with *Pseudomonas fluorescens.*

Instructions were given to abandon the old shallow well and to sink a new one through the rock. Owing to the difficulty of obtaining another site for the new well it was bored some 3 ft. from the old one, to a depth of 180 ft. After the construction of the new well the surface flavor in the butter became more pronounced than ever. Analysis of the deep well water showed that it, too, was grossly contaminated. The old well was chlorinated and filled up, for it was presumed that water from it was seeping down the sides of the casing of the deep well; but no improvement followed.

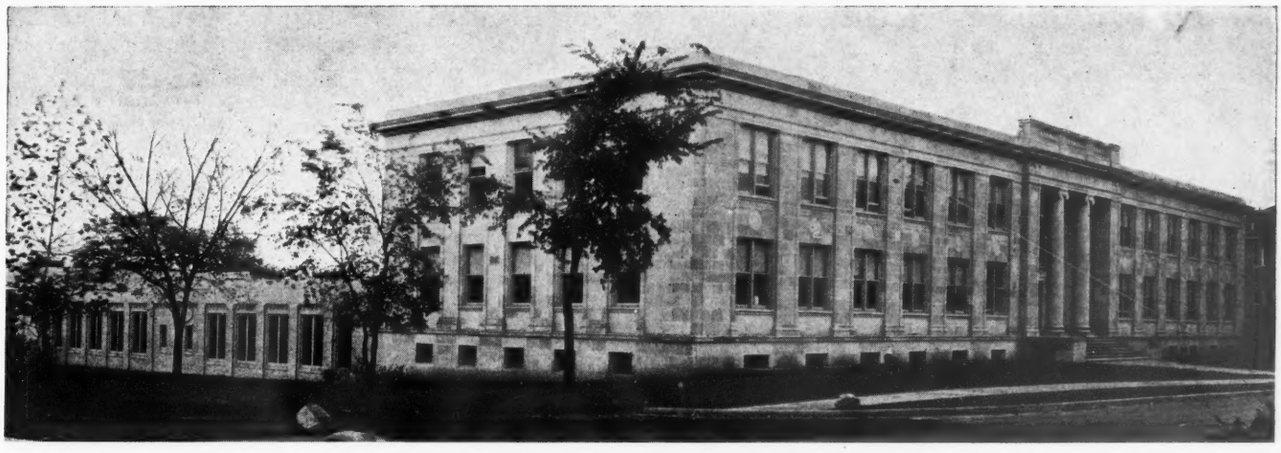
Samples of water taken from the bottom of the new well proved to be relatively free from pollution. Arrangements were then made to secure water from the bottom of the well through a smaller pipe inserted inside the casing. Since that time the surface flavor has disappeared from the butter. Data from the numerous analyses of the water of the new well indicate that the casing was cracked somewhere below the surface of the ground, probably within the first 15 ft.

Rainy Weather Unfavorable

Surface flavor developed in the butter of several other creameries following a prolonged period of rainy weather, but disappeared immediately after fine weather set in. Examination of the water supplies of each creamery in the rainy weather showed them to be contaminated with *Pseudomonas fluorescens,* but as the contamination disappeared quickly and the flavor of the butter was improved with the weather, no action was taken.

In conclusion, the fact may be stated that water supplies have been found to be the source of the bacteria that cause surface flavor in pasteurized sweet cream butter. In several instances the water supplies were free from intestinal bacteria and thereby suitable for human consumption, while at the same time carrying large numbers of putrefactive non-intestinal bacteria that proved to be the cause of the flavor outbreaks.

*For other damage done by this bacterium see "Infected Ice Discolors Halibut." F. C. Harrison and W. Sadler, Food Industries, April, 1929.



Dairy industry building, Iowa State College

The DAIRY INDUSTRY *Goes to College*

By L. K. ARNOLD
Engineering Experiment Station
Iowa State College
Ames, Iowa

THE motto "Science with Practice" underlies the activities of the dairy industry department of Iowa State College at Ames, Iowa. The ideal of Prof. Martin Mortensen, head of the department, is not only to teach students to operate sanitary plants, producing high quality dairy products, but also to make the semi-commercial laboratory equipment of the college show a profit on its operations. In this way modern methods of dairy and creamery management are shown to be possible from an economic standpoint as well as desirable from a sanitary point of view.

Leadership from Iowa State College has been a large factor in helping the buttermakers of the State of Iowa win the National Creamery Buttermakers Association Prize Banners for the ten best scoring samples of butter for the years of 1921, 1923, 1924, 1925, 1927 and 1928. During the seven years preceding 1927 the quantity of creamery butter produced in the state doubled and the total value of the dairy products had increased in 1927 to $154,799,922. The building of the new $500,000 dairy industry building at Iowa State College, which was completed in September, 1928, is in line with the development in the industry.

The purpose of the dairy industry building is to provide facilities for the educational work of the department in training students in the science and practice of the dairy industry; for the dairy research of the Iowa Agricultural Experiment Station, and for the dairy section of the Agricultural Extension Service. The dairy industry department is separate from the dairy husbandry department and deals with the processing, manufacturing, and distribution of dairy products such as market milk, butter, cheese, ice cream, evaporated milk, and dried milk.

The primary object of the department is not simply to train men in the mechanics of the industry but rather in the underlying fundamentals. Courses are offered of collegiate, graduate, and non-collegiate grades. The four-year collegiate course offered by the department leads to the Bachelor of Science degree and includes courses in fundamental subjects such as English, chemistry, bacteriology, economics, as well as courses in the phases of agriculture relating directly to the dairy industry and specialized courses in dairy industry work. The latter courses include such subjects as farm dairying, dairy principles, domestic and foreign varieties of cheese, testing and inspecting milk and its products, judging dairy products, manufacture of butter, manufacture of ice cream and ices, market milk, management of dairy plants, commercial dairying, condensed-milk products, dairy bacteriology and research.

A survey of 241 graduates of this course gives the following data: full college professors, 13; associate professors, 9; assistant professors, 9; instructors, 8; college fellows or assistants, 5; owners of dairy plants, 33; managers of dairy plants, 33; superintendents of dairy plants, 30; bacteriologists and chemists, 9; high school teachers, 7; assistant managers of dairy plants, 7; assistant superintendents, 5; field superintendents, 5; sales managers, 7; assistant sales managers, 6; salesmen, 7; county agents, 4; editors of dairy papers, 4; and miscellaneous work, 11. For those students who are not able to complete a four-year high school course there is offered a course of two years of six months each.

After taking the fall and winter quarter of the first year the student is required to work for at least five months in commercial dairy plants before taking the two quarters of the second year. This course trains men as butter, cheese and ice cream makers, as market milk

operators, and as managers of dairy plants. Graduate courses leading to the Master of Science degree are offered in dairy plant management, dairy bacteriology, and the manufacture of dairy products and to the Doctor of Philosophy degree in dairy bacteriology. The present enrollment includes 16 graduate students, 117 four-year collegiate-course students, and 46 two-year non-collegiate-course students.

For experienced buttermakers, creamery managers, ice cream makers, and market milk plant operators, there are the ten-day short courses. In addition there is a one-week course for field men. Dairy men from not only Iowa but eighteen or twenty states and from Canada crowd into the college halls every year for these short but intensely practical courses. But there are still those who cannot come to the college at all, so the college goes to them through the extension department. Four men who travel over the state lecturing and holding local short courses have their headquarters in the dairy industry building, where they can keep in close touch with the latest developments of the department.

The beautiful white stone exterior of this new building, designed to harmonize with the other main buildings of the campus, has little to indicate the practical nature of the laboratories within. The buff brick halls of the two-story frontage of the building open into numerous laboratories, class rooms, and offices. Complete chemical and bacteriological laboratories are maintained for research. Extending back from the front portion of the building are two one-story ells which house the large-scale laboratories.

These laboratories, in which the students secure their practical experience, have in common several noticeable characteristics. The smooth marble-like terrazzo floors and white tiled walls with their rounded corners seem to have been made to be spotlessly clean. The broad, tall windows flood the laboratories with natural daylight. The rows of machines in white and in polished metal with the white-clad operators complete the picture of ideal cleanliness. There are no shaftings to drip oil on the floor or pulleys and no belts to scatter dirt, for each machine is driven by a direct-connected electric motor. Milk or cream is pumped from one piece of equipment to another through sanitary piping which is taken down after each use for washing and sterilizing. Water and steam are used generously on equipment and floors.

One of the research laboratories, dairy industry department, Iowa State College

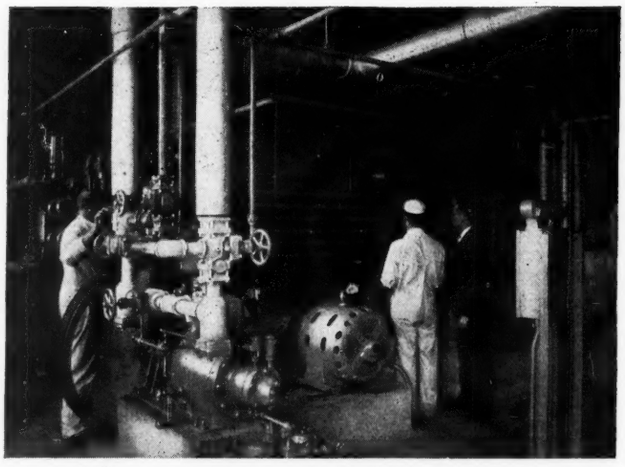
While the laboratories are designed primarily for the training of students they are operated on a commercial basis to return to the college as much as possible on the heavy investment. No attempt is made to compete with commercial firms, practically all of the products being sold to the community immediately surrounding the college.

A visit to the market milk department reminds us that the days of the old tin-pail distribution from the contented family bossy are now matters of history. As with other lines of food products, sanitary handling and distribution have become essential to the market milk business.

The milk received from the college farm and the local farmers, is weighed and strained through cloth or by means of a centrifugal clarifier before going to the pasteurizer; while the cans, as fast as emptied, are washed by a rotary can washer.

All market milk, regardless of its source, is pasteurized. This is done to protect the consumer not only against the well-known possibilities of tuberculosis and readily transmitted contagious diseases such as typhoid but also against the less frequent bovine diseases such as cause Malta fever in man. The milk is run counter-current to the hot water, which enters at 110 deg. F. Pasteurization is by the vat method at 140 to 145 deg. F. for 30 minutes in two rectangular vats, one of 300 and one of 200 gallon capacity. After bottling the milk is held in a cooler at 35 to 38 deg. F. until ready for delivery.

In order to maintain a uniform quality of cream it is separated from the milk in the department, no cream being bought from the farmers. Whipping cream is neither pasteurized nor homogenized, as either treatment interferes with proper whipping. Excess milk over that required for market milk and cream and for ice cream and cheese manufacture is separated, the cream



Refrigeration machinery, dairy industry department, Iowa State College

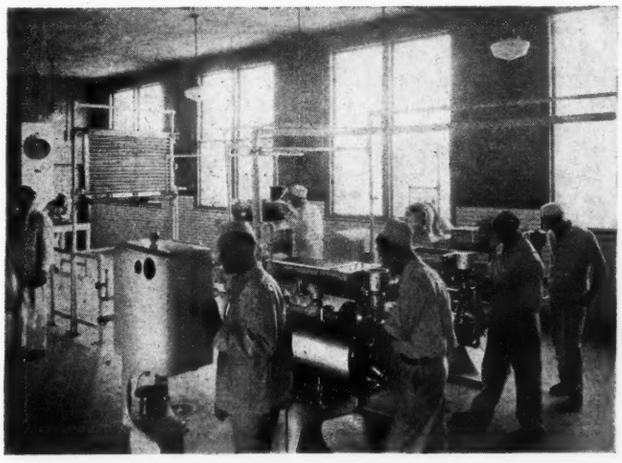
going to the butter department and the skim milk to the milk powder department.

But not all of the milk that is delivered to the homes is in bottles. Evaporated milk is used in many American homes in place of fresh milk, because of its convenience in storing or because of difficulty in securing satisfactory quality of fresh milk. Not only is evaporated milk widely used but the use of dried milk is increasing with great rapidity. So, in keeping up with the progress of the industry, we find two complete small-scale dried-milk outfits and an evaporated-milk outfit in the condensed-milk laboratory.

A roll type of milk drier with a capacity of 40 lb. of dry milk powder per hour is used for drying buttermilk. A spray drier plant with a capacity of 45 lb. of dry milk per hour is used for drying skim milk. The college disposes of all the powdered skim milk with little diffi-

culty in local markets for use largely in the ice cream and baking industries. For the well-known tin-can variety of evaporated milk there is a single-effect evaporating pan with a copper receiving tank.

A pasteurizer and ripener vat is used for pre-heating the cream before pasteurization. Both the flash and vat method of pasteurization are used, the latter more frequently. For flash pasteurization the cream is heated in a pasteurizer at 175 to 180 deg. F. for 10 minutes and then cooled on cooling coils to churning temperature. Vat pasteurization may be carried out on a large scale in a 300-gallon twin-coil pasteurizer and ripener or in either a 200 or 300-gallon pasteurizer at the same temperature used for market milk. For research work there are two 100-gallon pasteurizers. All of these pasteurizers are



Ice cream laboratory, dairy industry department, Iowa State College

equipped with recording thermometers. These vats are used also for ripening where this is necessary.

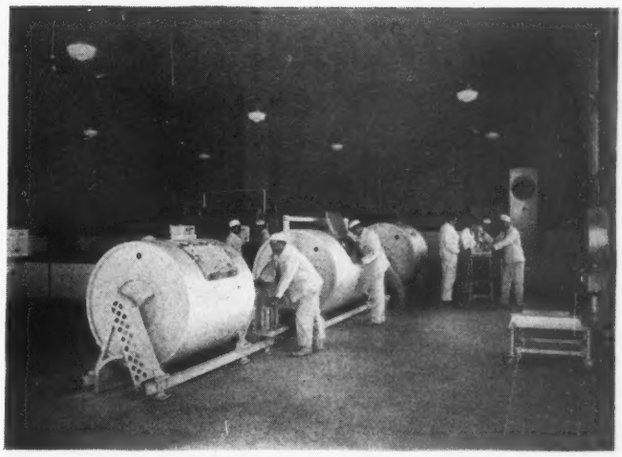
There are five churns available—two 750-lb. churns, and a 500-lb. churn for commercial work and two 90-lb. churns for research. All of these churns are of wood. The pasteurizing vats are arranged in one row with the churns in a parallel row corresponding to their supply vats.

The quality of the cream and butter is determined in a control laboratory opening off the main butter laboratory. Here the cream is tested for fat content. Moisture, fat and salt are determined in each batch of butter as routine tests. For more accurate tests on the butter fat and total solids in ice cream mix and cream, a Mojonnier testing outfit is used. But tests alone cannot guarantee the best butter. The students have regular classes in butter judging where the butter is judged by taste. Butter-judging teams have made a reputation for the department at the various judging contests over the country.

In the ice cream laboratory the various ingredients are mixed together in a 50-gallon mixer. After mixing, the mix is pumped through a homogenizer to a tubular cooler. After cooling the mix is aged for 24 hours in a 50-gal. cylindrical tank with agitator and cooling jacket. The mix is kept between 32 and 40 deg. F. during the aging process.

The laboratory has three freezers each of 40 quart capacity. One is cooled by direct-expansion and the other two by brine.

The fact that Iowa is not a cheese manufacturing



Butter laboratory, dairy industry building, Iowa State College

state is not due to a lack of training in the fundamentals of the industry. Cheese manufacturing is a part of the dairy industry course. The product must be good cheese for it is in great demand wherever it has been introduced. The cheese laboratory is equipped with a number of tin-lined wooden vats where the curd is separated from the milk by either the acid or rennet method. There are pressing frames for the round long-horn cheeses and for the rectangular blended cheeses. Steam-jacketed copper blending kettles are used in mixing the ingredients for pimento and other blended cheeses. For ripening and storage there are several cooling rooms.

Every laboratory except those for evaporated and dried milk has its cork-lined brine-cooled cooling rooms. The brine for these and the equipment requiring it is cooled by a complete refrigerating plant equipped with two compressors. The plant also is equipped for making the ice necessary for icing the ice cream.

Packaged Fish an Important Industry

The importance of the package fish trade in the United States is shown by figures recently compiled by the Bureau of Fisheries. In 1928 the total production of packaged fish in the United States amounted to 65,245,376 lb., valued at $9,790,024. To produce this total about 160,000,000 lb. of fish was used. Eighty-five plants operated in this industry in 12 states.

Haddock accounted for 87 per cent of the total quantity prepared. Following in order were cod, with 3 per cent of the total; squeteaque, 2 per cent; hake, 2 per cent, and croakor, 1 per cent. About 17 other species were packaged in smaller quantities. Predominating among those species of lesser importance were flounders (including sole), cusk, and halibut.

Massachusetts accounted for 65 per cent of the production. Connecticut and New York followed with 28 per cent. Virginia and North Carolina accounted for 4 per cent, and Maine 2 per cent. One per cent was produced in the Gulf and Pacific Coast states.

Considered according to the method of preparation, fillets accounted for 89 per cent of the production, dressed fish, 4 per cent; pan-dressed fish, 3 per cent; sticks, 3 per cent, and the remainder consisted of steaks and tenderloins.

Mineral Elements in Foods

Aid in Treatment of Dietary Deficiency Diseases

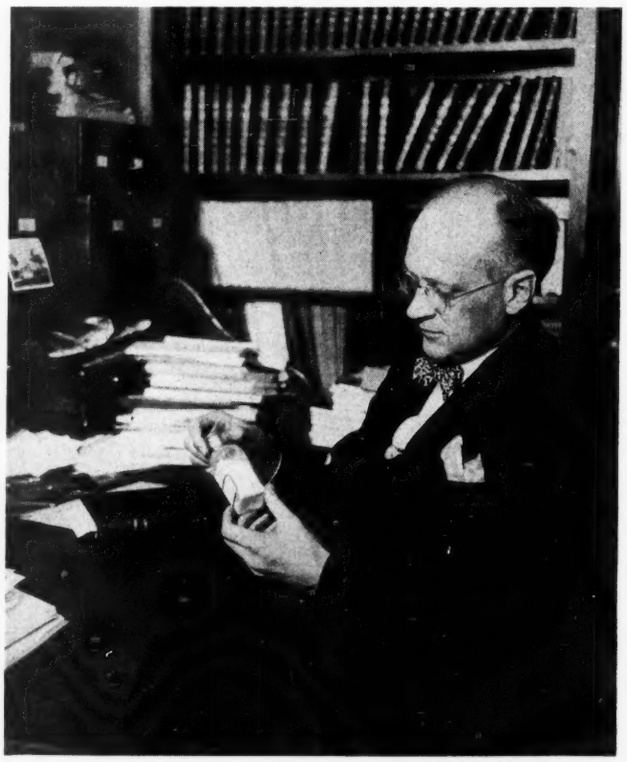
By F. L. DUNLAP
Consulting Chemist, Chicago, Ill.

SOME time ago the author of this article listened to a splendid lecture on the "Chemistry of Little Things," given by a leader in his field. He spoke with regard to the vitamins, and no one would now question seriously how vital are these "little things" to health and well-being. In the same field of nutrition and health, the same topic of the "Chemistry of Little Things" might with equal propriety be applied to mineral metabolism. but the story that might be told is an abridged one; it could be said that the first chapter had hardly been written. It will be of interest to note just a few of the significant facts in this now unfolding story.

The importance of iodine for the synthesis of thyroxin within the thyroid gland and the importance of thyroxin for normal health are now well known. Only a very little iodine is necessary—perhaps not over 3 milligrams per week—yet have it we must, else the body rebels because of its lack, and the rebellion shows its results in well-recognized pathological conditions. Fortunate, from the iodine standpoint, are those who live near the sea, or are so situated as to be able to get a satisfactory quantity and quality of food from the sea, or food grown nearby. Not long ago, Morse found, on examining cranberries, that those grown in Massachusetts, nearest to the sea, were highest in their iodine content and that this same characteristic likewise is true of potatoes, cabbage, apples and lettuce. And again we learn that the milk from cows raised on pastures near the seashore of the North Sea showed an iodine content 50 to 800 per cent greater than milk from the cows of Upper Bavaria.

A fascinating story has come from the research workers at the University of Wisconsin. Anemia has been treated with a great deal of success by feeding liver, liver ash, or certain liver extracts. These liver products all contain iron as an ingredient, and iron in small amounts is necessary for hemoglobin building. The hemoglobin content of the blood of the anemic must be built up and iron is a necessary factor. But why are liver products better than other products containing iron? These investigators, Hart and his associates, found that traces of copper are present in the liver and that this trace activates the iron present, so that its effectiveness in hemoglobin building is greatly enhanced. The value of copper in the treatment of anemia was briefly mentioned in the March issue of FOOD INDUSTRIES.

Iron in many forms has, in the past, been given for anemia. Oddly enough, it was sometimes beneficial and then again it was without value. An examination of medicinal forms of iron compounds has been made. Some have been found to contain accidental traces of copper and others contained none. Apparently, it was these unsuspected and wholly accidental traces of copper that enhanced the efficiency of the iron compounds.



Chicago Daily News Photo.

Dr. Harry Steenbock, professor of agricultural chemistry, University of Wisconsin. The bottle contains irradiated ergosterol crystals.

But it is not merely traces of copper that can aid in giving to iron that potency in anemia so much to be desired. Traces of manganese also have that power, as has been shown by Titus and Cates. And now it is asserted by Titus, Cave and Hughes that when *both* copper and manganese are employed, the response is quicker than when either alone is used.

One seldom thinks of arsenic as necessary for cell life, yet Gautier, and more recently Bertrand, have emphasized the importance of this mineral element as a con-

stituent of the living cell. But here again we are dealing with minute amounts of the element.

For the growth of bones and teeth, apparently small amounts of silicon and of fluorine seem to be necessary. What function zinc plays, if any, is not yet clear. The Eskimos live largely on the raw liver, glands and oils of mammals and of cod fish. Their food is rich in iodine, iron and manganese, and also contains small traces of zinc and copper. The zinc may have its function in some fashion as yet unknown.

We now begin to realize, as never before, the significance of these "little things"—those traces of copper, manganese, iodine, silicon, iron, fluorine and possibly zinc—in the activation of certain life processes; of catalyzing them, if you will, into normal channels.

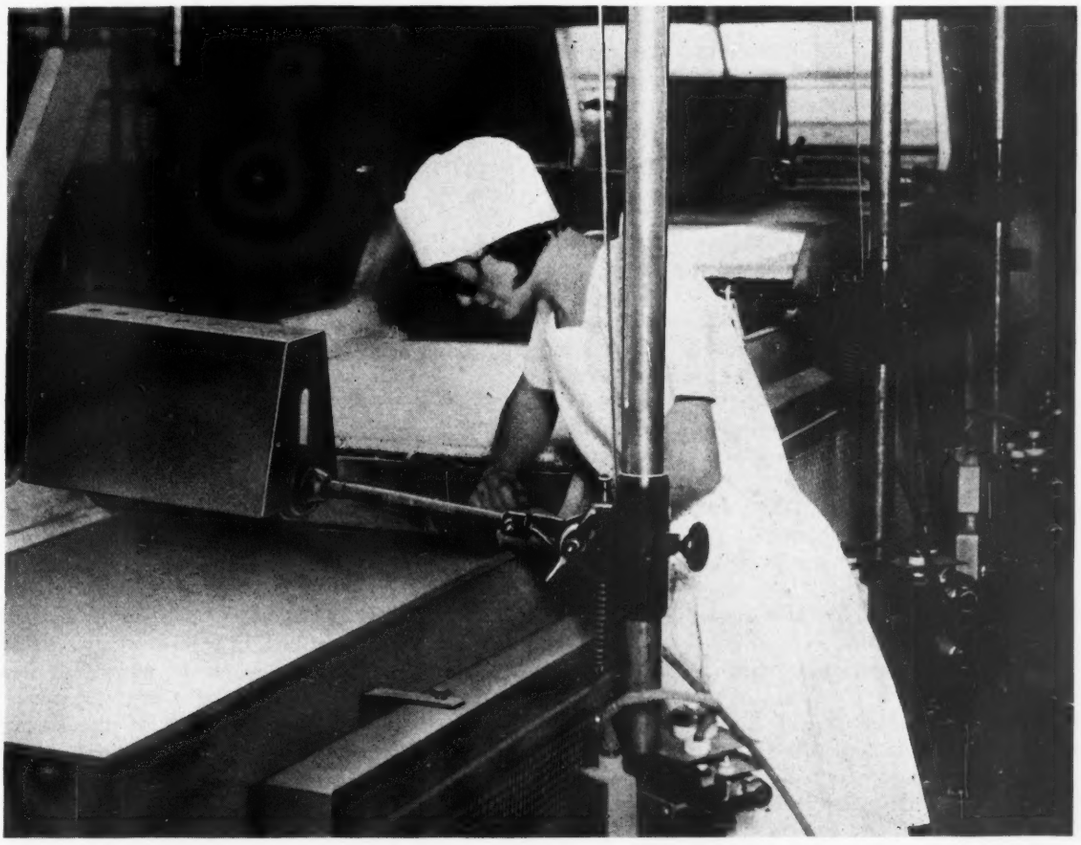
A truly remarkable work is now being done in parallel lines by investigators in plant life. The need for extremely small traces of such elements as boron and zinc for proper plant growth is now being shown. One part of each of these elements in two million parts of the nutrient solution induce healthy growth; but if not present, even in this extreme dilution, healthy growth does not ensue. With such facts as these in mind, it is not beyond the realms of possibility that traces of these or other mineral elements will be found of equal importance to full human health. Traces of these elements may indeed be necessary, while more than traces act harmfully.

Human beings, as well as animals in general, are frequently found in "negative calcium balance"—i.e., the calcium intake is less than the calcium outgo in the urine and the feces. From what source does the body supply this excess? The results of a study of this fundamental problem was published in January of this year by Bauer, Aub and Albright, of the Massachusetts General Hospital. It has clearly settled the point as to where the main storehouse of the mineral reserve of the body lies. These authors have definitely proved in the case of cats that the mineral reserve supply rests in the bone trabeculae—that lace-like structure found at the ends of the bones and which has been considered as of value in giving strength to the bones when the muscles were under tension and as adding to the rigidity of the bones. But if the trabeculae have this duty, they have still another: namely, that of a mineral reserve supply.

In the experimental work of these investigators the animals were placed on either a high or a low calcium diet. After maintaining this diet for a number of days, one of the fore legs was amputated under ether anesthesia. Then the diet was reversed for several days, after which the animals were sacrificed. A comparison of the trabeculae of the corresponding members showed a large disappearance of them during the period of low calcium diet and the presence of a large number of trabeculae formed during the period of high calcium diet. These results were further checked by the use of alizarine red, which has the power of staining newly forming bone. This work of Bauer, Aub and Albright is significant and quite comparable with our present views of a labile and a stable nitrogen reserve.

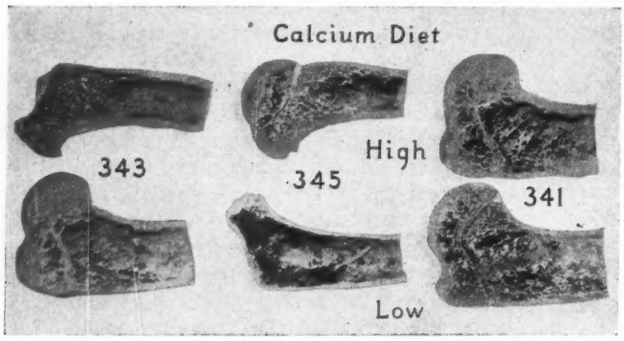
Normal mineral metabolism, at least so far as calcium and phosphorus are concerned—and these are the elements which quantitatively bulk the largest—seems to be associated with vitamin D; at least that is the viewpoint almost universally adopted. Yet rickets has been cured by Sherman and Pappenheimer without its use; in the

Fig. 2—Laboratory equipment for the experimental irradiation of cereals.
Des Moines Register Photo.



case of rats on a high calcium-low phosphorus diet, that is, rats having what is known as phosphorus-deficiency rickets. Without any other change in their diet, when the calcium intake was reduced and the phosphorus intake increased, the rachitic lesions in these animals were overcome. This has been checked also by other investigators.

The ratio of calcium to phosphorus in the food ingested does seem to play some part in the bodily retention



Illustrating the loss in bone trabeculae when passing from a high to a low mineral diet (343 and 345) and the gain in trabeculae when this is reversed (341). The change is least marked in 341, which cat had the lowest calcium intake when on a high calcium diet. This illustration is taken from the work of Bauer, Aub and Albright.

of these elements. Some quantitative human metabolism experiments in which the author of this paper has been interested seem to show that the normal calcium to phosphorus retention ratio is 2:1. It is not without significance that in this set of metabolism experiments one of the subjects was a man suffering from a fractured femur, and in his case the calcium to phosphorus retention ratio was nearer 1:1.

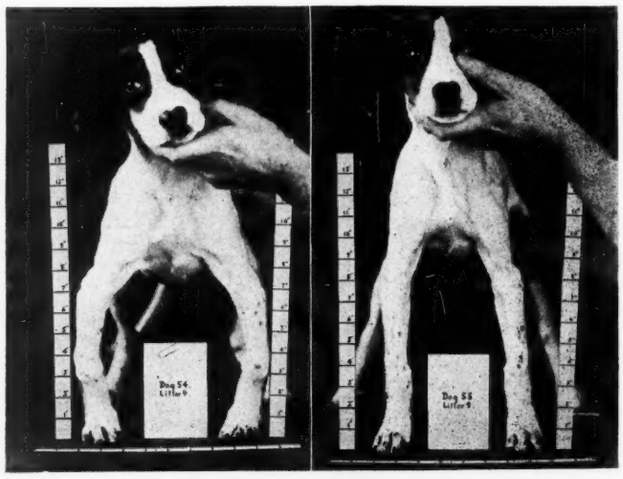
Even though the calcium to phosphorus ratio is of value in effecting their retention, yet the fact remains that, irrespective of their ratio, both of them are retained in a remarkable degree either under the influence of vitamin D or ultra violet light. Vitamin D, together with its associated vitamin A, as found in cod liver oil, is now more or less of an old story. Cod liver oil has become almost a steady diet in numerous of our households, as is shown by the fact that during 1928 over 2,000,000 gallons was imported into the United States. But the question naturally comes to mind, is it doing *all* that might be desired, so far as its vitamin D and its control of mineral metabolism is concerned?

No one can question the great value of cod liver oil in the dietary and the unquestioned good it has produced. But when one reads that Wilson, in a report of the radiographic examinations of many infants and young children, states that 97 per cent of them showed bone changes, notwithstanding they had all received biologically tested cod liver oil, one wonders if the fundamental mineral intake may not have been lacking in some essential way. As McCollum and some of his associates have put it: "Neither cod liver oil nor light meets the defects in the composition of the diet directly by supplying to the body either calcium or phosphorus; but meets them indirectly by so raising the potential of cellular activity as to secure the most efficient utilization possible of these substances available in the body, which are directly or indirectly concerned with ossification or calcification."

Even though vitamin D is something of an old story, it has been made new again through the fundamental discovery of Dr. Harry Steenbock of the University of Wisconsin, and the almost simultaneous announcement of the same, but independent, discovery, by Dr. Alfred F. Hess of New York. Dr. Steenbock has found that when foods are irradiated with ultra violet light—i.e., with the quartz mercury lamp—they assume the properties of foods containing vitamin D, although this particular vitamin was completely absent prior to the irradiation.

Splendid research work has followed this epoch-making discovery and now it appears that vitamin D is produced from a chemical substance known as ergosterol, which occurs in the oils and fats of both animal and vegetable origin. Ergosterol is associated with the so-called "unsaponifiable matter" of oils and fats, respectively with the cholesterol and phytosterol. What changes the ultra violet light induces in the ergosterol are not yet known, but the subject is now being intensively studied. In time the secret of the change will have been solved.

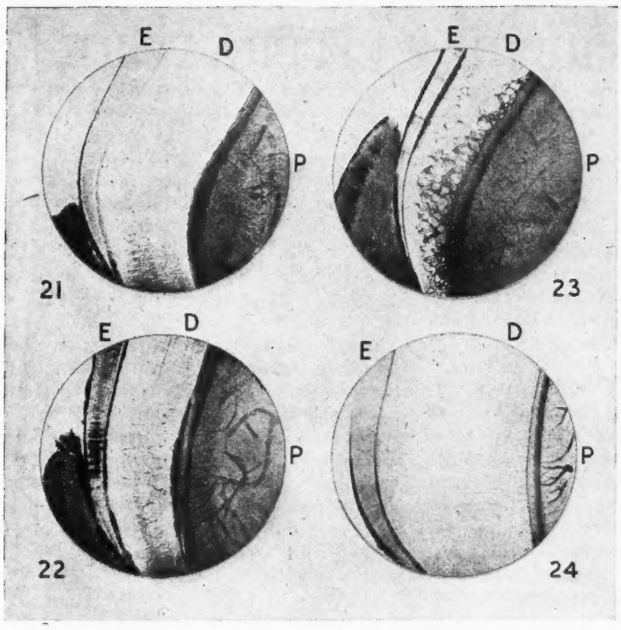
Since irradiated ergosterol has been recognized as possessing the properties of vitamin D, it has entered into therapeutic use by being dissolved in some oil, such as peanut oil. It is used as a substitute for cod liver oil, so far as vitamin D is concerned, but the peanut oil contains, in addition, fat soluble A. The irradiated ergosterol in oil solution is standardized very much stronger in its D content than cod liver oil. For example, one of these products is 100 times as strong as cod liver oil and one drop of it is equivalent in vitamin D potency to one and one-half teaspoonfuls of it. At



Litter mates fed on the same rickets-producing diet and kept under identical conditions, except that a portion of the food for dog 55 was irradiated, while the similar portion for dog 54 was not irradiated. The effect of ultra violet irradiation in producing vitamin D in the food and its effect on bone formation is readily observed. Dog. 54, receiving the non-irradiated ration, is markedly rachitic.

the present time there is one company offering on the market irradiated ergosterol in which the irradiation is brought about through sunlight.

On Aug. 14, 1928, the date of the issuance of the Steenbock patent for the use of ultra-violet light for the irradiation of foods, another patent was issued to Pacini for essentially the same purpose. In the latter case Pacini submits substances to rays longer than about



Ground sections of corresponding parts of the first lower molar teeth of four puppies. Diet was the same in quantity and quality and except for the type of cereal and fat eaten. E, Enamel; D, Dentine; P. Pulp. Fig. 21—White flour and linseed oil. Fig. 22—White flour plus germ and linseed oil. Fig. 23—Oatmeal and linseed oil. Fig. 24—Oatmeal and cod-liver oil. Fig. 21 has fairly thin enamel and dentine, the latter containing some interglobular spaces. Fig. 22 is worse in every way. Fig. 23, conditions still worse with very thin and badly formed enamel and dentine. Fig. 24 shows the effect of cod-liver oil in producing a thick and practically normal enamel and dentine. This illustrates some of Mrs. Mellanby's work and the pictures are taken from a report of the British Medical Research Council.

3,022 Ångström units. The principles of the Steenbock patent are now being used in the irradiation of cereal products and one company is already offering two such irradiated cereals to the public.

The irradiation of cereal takes on particular significance in view of the work of Mrs. May Mellanby, of Sheffield, England. She has carried on extensive investigations on the effect of cereals on the structure of the teeth. Her work has involved observations on 1,400 dogs, and the preparation of over 2,000 ground sections of their teeth and joints, as well as many hundreds of experiments on rabbits and rats. She found that cereals in general produced hypoplastic teeth, but that when such cereals were irradiated, or when non-irradiated but used with cod liver oil, the structure of the teeth became practically normal.

This work of Mrs. Mellanby, as well as that of a host of other workers in this field, has called attention to the possibilities of controlling dental caries, especially in children, through proper dietary methods. The progressive caries of childhood has been controlled by Boyd and Drain, of the State University of Iowa, in a group of diabetic children who were fed, among other things, approximately a quart of milk and cream daily, together with cod liver oil. The energy-producing foods consumed by these children were the fats, rather than the carbohydrates, and were furnished principally by cream, butter and egg yolk. The ash of the diet was predominantly basic, which Boyd and Drain suggest might probably be significant.

Mrs. Mellanby, in December of last year, published an article in the *British Medical Journal* in conjunction with C. Lee Patison, on "The action of vitamin D in preventing the spread and the arrest of caries in children." These authors state that in a group of 21 children, whose average age was 5½ years, the addition of vitamin D in the form of irradiated ergosterol checked the initiation of new carious points, diminished the spread of old carious points and arrested the infective process in many carious teeth. This investigation corroborated those previously made, in which it was found that the carious process in the teeth of children could often be inhibited by increasing the intake of fat soluble vitamins by the addition to the diet of cod liver oil, egg yolk and extra milk.

The work of various investigators in the dental field all lead to the conclusion that dental caries is based primarily on the lack of proper mineralization of the teeth, with a consequent lowering of their resistance to bacterial attack, which results in decay. It is becoming recognized that the teeth's resistance can be built up to withstand this bacterial attack, and the way is now being pretty clearly pointed out for overcoming, in the main, this most common of dental diseases. Dr. William Weston has expressed the view that caries and rickets, taken together, "constitute the greatest challenge to civilization of all problems with which we are called upon to deal." We have about reached the conclusion," he says, "that their evils are the foremost enemies of the Nordic race in the temperate zone."

If the teachings of recent research work on the control of caries can be spread and the lessons made use of in a practical way, a significant step will have been taken in controlling this most common of human ills. There is hardly a human being in our midst of whom caries has not taken its toll.

Oiled Rice Popular in Spain

Two processes are generally used in the milling of rice in Spain: polishing and oiling. For either polished or oiled rice the grain is first husked and then put through the usual cleaning and whitening process. It is then ready for sacking and sale in that form or for the polishing or oiling treatment.

In making oiled rice the grains are not polished previous to treatment but are treated in the condition in which they come from the mill after brushing. Any pure tasteless oil may be used. In practice liquid petrolatum or refined mineral oil obtained from the United States appears to be preferred, although some mills use olive oil, which is, of course, available in large quantities in Spain. No wax or any other material is used in the process or added to the oil.

A simple machine applies the oil to the rice. It consists of a hollow revolving cylinder 80 cm. in diameter and 250 cm. long with a series of horizontal rods inside it. The rice and oil enter through adjacent openings, so arranged at one end of the cylinder that the oil falls on the rice and thoroughly mixes with it during their passage through the cylinder. No further treatment is required and the oiled rice is not graded for size before marketing.

Rice oiled in this way is said to possess a finer and more attractive appearance than polished rice. Its keeping qualities are greatly enhanced and it resists the attack of weevils for a much longer period. It is also preferred by the market to rice treated in any other way.

ABSTRACTS · OF · CURRENT · LITERATURE

WATER ABSORPTION. J. L. St. John and C. H. Bailey. *Cereal Chemistry* 6, 140-50, March, 1929. The power requirement of an electrically operated dough mixer offers a simple and convenient means for measuring consistency of doughs. This method was utilized to test the theory that dry skim milk should be reconstituted before use, in order to lead to maximum water absorption in the dough. Power input data confirmed this assumption; for each unit of dry skim milk added, a dough will absorb about one unit of water in returning to the same consistency as before the addition. This observation was confirmed by measurements with a Chopin extensimeter, and with a plastometer (Bingham and Murray method).

* * *

PREDICTING MIXING TIME. *Bakers Weekly*, Vol. 61, p. 69, Feb. 2, 1929. P. G. Pirrie. The experience of the engineering department of this publication shows that the electrical method of controlling the mixing time does apply to different types of flour. The horsepower input of a dough mixer is recorded on a chart and gives typical graphs. The mixing period extends for several minutes until a maximum consumption of power is recorded, after which the horsepower value decreases. In the case of flour, important factors are its nature, its absorption value, pH number, and amount of bleach.

* * *

THE VITAMIN A, B, AND C CONTENT OF ARTIFICIALLY VERSUS NATURALLY RIPENED TOMATOES. M. C. House, P. M. Nelson and E. S. Haber. *Journal of Biological Chemistry* 81, 495, March, 1929. The vitamin content of green, air-ripened, ethylene-ripened, and vine-ripened tomatoes is the same. Ripened tomatoes contain a greater content of vitamin A than green mature fruit, but the vitamin A content of the latter remains the same regardless of the method of ripening used. Air-ripened and ethylene-ripened tomatoes are richer in vitamin C than the green fruit, which is relatively poor in this vitamin. The commercial method of ripening tomatoes in an ethylene-air mixture produces fruit equally as rich, in the vitamins A, B, and C, as fruit picked green and ripened in air.

* * *

BAKING AND pH. E. A. Fisher and P. Halton. *Cereal Chemistry* 6, 97-115, March, 1929. Previous experiments had indicated that the increased acidity resulting from prolonged dough fermentation had little or no relation to the spoilage which resulted. Thus, the pH change due to fermentation may be 0.25 to 0.45; but a greater change (0.7 to 0.9) effected by adding tartaric acid had no effect on dough quality which could be called significant. This has been confirmed by new baking experiments with a wide variety of flours over a pH range from 7.80 to 4.20, with varying periods of fermentation. The changes which do appear to result from increased acidity are partly favorable and partly unfavorable. In the main it is observed (but not invariably) that dough toughness is increased and flavor becomes more pronounced. Color of crumb is often improved. There appears to be little or no effect on stability. In doughs from patent flour a large increase in acidity slightly accelerates the rate of fermentation; but this was not observed in doughs from straight run flour. Gas production is hardly affected by high acidity but is somewhat sensitive to very low acidity (pH as high as 7.5), since yeast works best in a slightly acid medium.

* * *

CORROSION IN MILK PRODUCTS. O. F. Hunziker, W. A. Cordes and B. H. Nissen. *Journal of Dairy Science* 12, 140-81, March, 1929. The corrosive effect of milk and its products was studied with 19 metals, plated metals or alloys used in dairy equipment. The single metals were Al, Cu, Fe, Ni, Sn and Zn; the plated metals were tinned, galvanized or Al coated; the alloys were Allegheny metal, Ascoloy, Enduro A, Monel metal, Ni silver and an alloy of Mg and Al. Tests were made with acetic, butyric, lactic and citric acids, compared with HCl and H_2SO_4; and with sweet and sour milk and cream products, including neutralized sour cream. Effects on the flavor and quality of the milk products were observed, since mere traces of some metals may impart a metallic or bitter flavor, or catalyze oxidation or bacterial attack. There is also the possibility that toxic concentrations of oxides or salts of some of the metals might be taken up by the milk products. In general the most corroded metals had the most damaging effect on the milk products. Corrosion tends to be greater in the acid solutions than in a milk product of equal or even greater acidity. Acidity and high temperature accelerate corrosion; but even in sweet milk at room temperature there is some attack on metals. Allegheny metal, Sn and tinned Cu did not affect flavor; but it is important that the copper be thoroughly and properly tinned. These metals were most resistant to corrosion. Monel metal tarnished, but had little effect on flavor. Ni silver tarnished badly and generally injured flavor. Ni tarnished readily, Al was sensitive to alkali washing powders, and the Mg-Al alloy was somewhat corroded. Fe, Cu and Zn (including galvanized Fe) are unsuitable for daily use. So is tinned Fe unless thoroughly and heavily tinned.

* * *

HARDENED FATS. Thomas Andrews, *Chemical Trade Journal* 84, 277-8 302-3, March 22 and 29, 1929. Some catalyst poisons occur as impurities in the oil to be hardened; for example, the unsaponifiable matter in a low grade crude cod liver proved to be an active catalyst poison. Other impurities which are under suspicion are: the nitrogenous foots from freezing out of fish oils; phosphorus (in lecithins or Ca phosphate); sulphur as thiocyanate; blood in body oils from fish, and nitrogenous matter in all oils.

* * *

EXTRACTED FEEDS. G. B. van Kampen. *Chemisch Weekblad* 26, 98-101, Feb. 16, 1929. Cases of sickness among cattle fed on extracted soy bean meal were attributed to some toxic substance left in the meal by the solvent. Repeated analyses failing to reveal any such substance, the possibility of deficiency of some needed element in the meal was investigated. Comparisons showed that trichloroethylene extracts more of the phosphatides from the meal than does benzine, so that soy bean meal extracted with trichloroethylene is deficient in phosphatides. The supposition that this deficiency caused the sickness was confirmed by changing to benzine-extracted meal; following this change the cattle became healthy.

* * *

SILICA GEL REFRIGERATION. Ernest B. Miller. *Refrigerating Engineering* 17, 103-8, April, 1929. In an automatic gel refrigerating cycle, a time clock arrangement is used to control the heating and cooling periods and a thermostat in the cooling chamber keeps the temperature within the proper limits. Silica gel is contained in a number of narrow steel tubes, nearly closed at one end and with a $\frac{3}{8}$-in. opening at the other. The preferred refrigerant is sulphur dioxide. Natural draft or forced ventilation may be used to convey the heating and cooling gases around the tubes. There is also a regenerative type for efficient utilization of all the heat energy put into the system.

* * *

FRUIT JUICES. John H. Irish. *Fruit Products Journal* 8, No. 7, 13-5, March, 1929. The difficulty in preparing a citrus fruit juice which can be stored without loss of flavor and freshness is not due to bacteria but to enzyme action. The temperature which destroys the enzymes also deteriorates the juice; but it has been found that flash heating will

destroy the enzymes without damage to the juice. Benzoate of soda is needed unless the juice is stored at 15 deg. F. or lower. Based on this treated juice, preparation of beverages from oranges, lemons, limes and grapefruit is feasible with stored juice. Beverages from grapes and various berries are also described, including blended drinks, still and carbonated.

* * *

ICE CREAM MIXES. J. C. Hening and A. C. Dahlberg. *Journal of Dairy Science* 12, 129-39, March, 1929. Salts of Na and Ca were added to ice cream mixes to check the idea that variation in the concentration of these salts in normal milk and cream accounts for fluctuations in viscosity, ease of whipping and fat globule clumping in ice cream mixes. Results indicate that there is actually sufficient natural variation to affect the whipping properties. Na citrate, K oxalate (toxic!) and Na_2HPO_4, added before pasteurizing and homogenizing, cause the mixes to whip more easily. In actual practice, it was found that addition of 0.1 per cent baking soda was uniformly effective in correcting difficult whipping when this trouble was encountered.

* * *

HIGH PRESSURE STEAM. August A. Busch. *Combustion* 20, 141-42, March, 1929. As part of the modernization program of the Anheuser-Busch plant for serving the corn products division, the yeast factory and other projects, it was deemed desirable to generate steam at 500 lb. pressure (about 600 deg. F.) instead of at 140 lb. as formerly. These conditions would not only meet all steam requirements for the foodstuffs processes but would also effect economies in generation of electric power, the cost of which would be lowered sufficiently so that the refrigerating machinery of the entire plant could be motorized. The steam will be generated at a maximum rate of 300,000 lb. per hour in two 1,100-hp. boilers and will operate a turbine which will exhaust steam at a pressure of 140 lb. A steam accumulator will be used to equalize fluctuations in the load.

* * *

PACKING FRUITS IN WINE. H. A. Barnby and E. L. Voigt. *Fruit Products Journal* 8, No. 6, 11-13, Feb., 1929. The presence of alcohol in wine packed fruits does not avoid the necessity of processing; alcohol gives little or no protection against the commonest types of spoilage. Lowering of alcohol concentration in the sirup may be due to diffusion of alcohol into the fruit, not to leakage or the other causes often suspected by the packer. The preferred sterilization treatment is to heat in a water bath at 180-190 deg. F., time being adjusted to the size of the container and the probable rate of heat transfer of its contents. If leakage through the seal occurs, accurate determinations of alcohol content of both sirup and fruit before and after processing will detect it.

DENSITY OF LARD. W. Halden and R. Kunze. *Chemische Umschau* 36, 61-62, Feb. 27, 1929. Attention is called to an error, which has persisted for years in the literature, which states the density of lard to be 0.931 to 0.938 at 15 deg. C. This probably originated in measurements with very impure lard by the alcohol float method. From a critical review of modern published determinations, it is concluded that the true range of density of pure lard is approximately 0.915 to 0.923 at 15 deg. C. This corrected range should be accepted as standard.

* * *

GELATIN AND STARCH. Wo. Ostwald and R. H. Hertel. *Kolloid-Zeitschrift* 47, 258-68, March, 1929. In the compounding of starch and gelatin, the phase separation phenomena involved in the colloid-chemical relations of the materials must be considered. Sols of agar, inulin and starches (from corn, rice, wheat and potatoes) were tried with gelatin sols. Potato starch gives, at certain concentrations, a liquid-liquid separation; all the others give a liquid-solid separation. In the liquid-solid separations, the volume of precipitate reaches a maximum at about 2 per cent gelatin, for example, when mixed with a 3 per cent sol of rice starch. The precipitation occurs within a few minutes after mixing. Concentration relations are shown in curves.

* * *

OZONE IN COLD STORAGE. Wm. J. Lohman. *Refrigerating Engineering* 17, 122-3, April, 1929. The necessity of thermal insulation of a cold storage plant eliminates the possibility of keeping the air fresh and sweet by sunlight exposure. Frequent renewal of the warehouse atmosphere is too expensive; but ozonization is quite as effective as sunlight in renovating fouled air and does not unduly increase the operating costs. Other advantages of the use of ozone are that humidity has relatively little effect in pure air and needs very little attention; and that odorous vegetables, such as onions and cabbage, can be safely kept together in the same room along with other vegetables for considerable lengths of time. It is not feasible to predetermine the required amount of ozone; it is best to supply enough to leave a perceptible ozone odor in the warehouse air.

* * *

FOODSTUFFS APPARATUS. H. Winkelmann. *Chemische Apparatur* 15, 217-8, 257-8, 279-80; 16, 14-6, 35-7, Oct. 10, Nov. 25, Dec. 25, 1928; Jan 25, Feb. 25, 1929. Recent developments in chemical apparatus and equipment, useful in foodstuffs manufacture and laboratory control, are described and illustrated with drawings and photographs. They include a new model Zeiss liquid interferometer; a carbon filter for potable waters; a vacuum drum drier with dust collector and surface condenser; several other models of vacuum driers; a system for pasteurizing fruit juice beverages; a system of milling cereals, without chemical treatment, to preserve mineral content and vitamines; the Seitz sterilizing filter for preserving fruit juices and the like without application of heat; an automatic flour weighing and dispensing machine; improved machines for processing fats, particularly for margarin manufacture; chocolate working apparatus; a new machine for processing sugar beets, without contact of human hands; the Oderberger colloid mill; a machine for washing and cleaning coffee without chemical treatment; the Teitge system for rapid smoking of meats; an automatic quick process stoneware vinegar making apparatus; a contact process for synthesis of acetic acid from coal and lime; a high pressure boiler for making mash from potatoes; and other improvements along similar lines.

* * *

VITAMINIZED MARGARIN. *Industrial Chemist* 5, 97-104, March, 1929. A process has been developed in Great Britain for bringing margarin up to the same standard of vitamin potency as cow butter. The vitamin D is obtained by irradiation of ergosterol with ultra-violet light; the raw material is an unsaponifiable fraction from fish liver oils, rich in vitamins A and D. After irradiation, this product is compounded with the margarin fats to give the desired potency, and emulsified with milk in the usual manner. The process is being worked on a commercial scale by a subsidiary of the Lever Brothers at the Bromboro Port works.

* * *

THE MASS PRODUCTION OF RAYED CEREALS. *American Miller* 57, 338, April 1, 1929. The Quaker Oats Co. is now irradiating its entire farina tonnage as well as Muffets, a whole wheat breakfast food. The nucleus of the process consists of light-treating equipment in the company's plants at Cedar Rapids, Iowa; Akron, Ohio; and Peterborough, Ont., Canada. Large Cooper Hewitt lights, 30 or 40 to a battery, create ultra violet rays for the cereal passing beneath them on "stagger-flow" conveyors. Rolled oats have been irradiated on an industrial scale at the Cedar Rapids plant. Rigorous tests have shown that for all practical purposes no loss in vitamin D content occurs under ordinary cooking or storage conditions. Some nutritional aspects of irradiated cereals are also discussed. Five photographs accompany the text.

* * *

THEORY AND PRACTICE OF FLOUR MILLING. B. W. Hodges. *National Miller* 34, 16, March, 1929. The first installment of a series of articles used in the training of millers in the Sperry Flour Co. mills. The "History and Development of Flour Milling" is discussed in this issue. The next issue will present part two of "Grades and Varieties of Wheat and Their Characteristics."

· CRITICAL · BOOK · REVIEWS ·

INDUSTRIAL EXPLORERS. By Maurice Holland. Comprises 347 pages. Published by Harper & Brothers, New York and London. Price $3.

THIS is a collection of word portraits of contemporary leaders of industrial research, delineated by the director of the Division of Engineering and Industrial Research of the National Research Council, with the assistance of Henry F. Pringle. In many cases, according to the authors, the scientists selected for inclusion in the volume were at first none too enthusiastically in favor of furnishing the details necessary for proper dramatization of their work and for the personal publicity involved. Their objections were overcome, apparently, by the argument that co-operation on their part would redound to the benefit of industrial research throughout the land, especially among college students, industrial executives, teachers in scientific, engineering, and technical schools, and the part of the general public that is concerned with modern industrial progress and likely to be interested in a recital of the romance underlying that progress.

Of the nineteen chapters, four are devoted to "accelerated experience" among the food industries, the topics treated being bread, canned foods, coffee, and fish. Here is detailed the work done by Harry E. Barnard, as president of the American Institute of Baking, in fostering the standardization of the commercial loaf of white bread at its present gratifyingly high level of excellence; by Willard D. Bigelow, director of research of the National Canners' Association, with his laboratory on wheels, which has been mentioned in these columns; by Prof. S. C. Prescott, of the department of biology and public health at Massachusetts Institute of Technology, at the behest of the Joint Coffee Trade Publicity Committee, in determining the ideal method of brewing coffee; and by Harden F. Taylor, of the Atlantic Coast Fisheries, in connection with fish refrigeration, filleting, and, more latterly, quick freezing, or "frosting."

Other chapters describe ferrous alloys resistant to fatigue and corrosion, as developed by John Alexander Mathews, of the Crucible Steel Company of America; brass compounded to predetermined standards by William H. Bassett, of the American Brass Company; cement making under technical control devised by Franklin R. McMillan, of the Portland Cement Association; the tanning of leather, as studied by George D. McLaughlin, of the Tanners' Council of America; modern paper making as developed by Hugh K. Moore, of the Brown Paper Company; heat-resistant Pyrex glass, the contribution of E. C. Sullivan of the Corning Glass Company; the high explosives made by E. I. du Pont de Nemours & Company and their post-war denaturing under the direction of Charles L. Reese; the perennially fascinating story of the birth of Bakelite; the Sperry gyroscope and searchlight; the Kodak, films, and C. E. K. Mees; airplanes built to predetermined specifications by William H. Miller, of the Curtiss Aeroplane & Motor Company; the always interesting work done at Boston by Arthur D. Little and his associates; modern telephony and the important contributions thereto of Frank B. Jewett, of the American Telephone & Telegraph Company; and the fundamentals of applied electricity as given to the world through Willis R. Whitney, of the General Electric Company, and C. E. Skinner, of Westinghouse Electric & Manufacturing Company.

To the food manufacturer each chapter should be of almost equal interest. He is quite as likely to profit by the experiences of those working in steel as in foodstuffs. It is all of it highly informative and of constructive value to those who may be deliberating the ever-present question of corporate or associational industrial research work.

Some will be disappointed in that the basic principles properly underlying such research seem to be nowhere explicitly resolved into definite tenets ready for acceptance—or, perchance, challenge—by others. That the philosophic setting is a bit hazy may be the necessary corollary of attempting to epitomize a field so inclusive in nature and varied in setting, and involving so considerable a body of men of widely different temperaments working under varying conditions.

In style it strikes a happy medium between the racy idiom of some of the ultra moderns and the dull prose of mere historicity. At times the dramatization of technical achievement seems a bit labored. Generally speaking, however, it is succcessfully accomplished; and especially so when dealing with subjects that lend themselves well to the theatric, as, for example, the daybreak tests of airplanes—a passage that is of almost lyric quality.

R. G. GOULD.

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INDUSTRIAL CARBON. By C. L. Mantell, D. Van Nostrand Company, Inc., New York. 410 pages. Price $4.50.

IN TECHNICAL LITERATURE there are many so-called "monographs," but most of them are merely undigested and unreadable compilations of technical fact or opinion. This volume on industrial carbon seems to deserve in unusual degree the designation "monograph," for it is a readable, well written, carefully digested summary of available information on the many forms and manifold uses of carbon.

On first reading one might accuse the book of superficiality, because it is so cleverly written, in an informal readable style, that it may give an impression of casualness. A second thoughtful consideration reveals the fact that all wanted information which could reasonably be expected in a volume of this size is present and that it is only the unexpected readability of the work that gives the first and erroneous impression.

The book is one in which the technical reader will find double interest. It is one that he can profitably peruse in odd times because of the general information afforded. It is also one that apparently will stand the test of frequent reference use.

R. S. MCBRIDE.

· GOVERNMENT · PUBLICATIONS ·

Documents are available at prices indicated from Superintendent of Documents, Government Printing Office, Washington, D. C. Send cash or money order; stamps and personal checks not accepted. When no price is indicated pamphlet is free and should be ordered from bureau responsible for its issue.

Commercial Weighing and Measuring Devices. Bureau of Standards Miscellaneous Series 85 (superseding Handbook No. 1). Fifty cents. Specifications and tolerances for scales, meters, and all types of such devices used industrially.

Markets for Dairy Equipment and Supplies in Continental Europe. Bureau of Foreign and Domestic Commerce Trade Information Bulletin 618. Ten cents. Document intended to aid in foreign market development.

Market for Foodstuffs in the Netherland East Indies. Bureau of Foreign and Domestic Commerce Trade Information Bulletin 619. Ten cents.

Market Data Handbook of New England. Bureau of Foreign and Domestic Commerce Domestic Commerce Series 24. $1.75. A thorough analysis of trade territories, maps of trade territories, railroads and highways — pertinent data for building sales quotas.

Dairy Statistics. U. S. Department of Agriculture Statistical Bulletin 25. Thirty-five cents. Comparable data for various years, through December, 1926, for all types of products and for many features of the milk-producing industry itself.

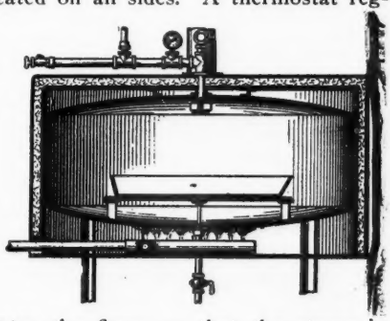
Food Animals and Meat Consumption in the United States. U. S. Department of Agriculture Circular 241. Five cents.

Containers Used in Shipping Fruits and Vegetables, by H. A. Spilman and Robert W. Davis. U. S. Department of Agriculture Farmers Bulletin 1579 Ten cents. Specifications, with a discussion of advantages and limitations of various types of containers applicable to each commodity.

Salt, Bromine, and Calcium Chloride in 1928. The customary statistical statement issued by the Department of Commerce in preliminary form.

· SELECTED · PATENTS ·

Rapid Non-Drying Cooker—Edmund M. Simonds, Wilmette, Ill., assignor, by mesne assignments, to E. M. Simonds Devices Company. No. 1,702,854. Feb. 19, 1929—A modified pressure cooker in which the cooking vessel is heated on all sides. A thermostat reg-



ulates the flame so that the steam in the cooker is kept saturated and evaporation of the water from the food is prevented. Cooking proceeds both from the heat of the steam and by radiation from the walls.

* * *

Accelerating Cheese Making—Joseph R. Brehm, Chicago, Ill. No. 1,704,458. March 5, 1929—Lactic acid forming bacteria are grown in sterile milk media to which solutions of tryptic or peptic digested protein are added. This treatment speeds up the growth of the bacteria with corresponding decrease of coagulation time when cultures of the desired strain are added to milk to be made into cheese. A method of thus growing Lactobacillus acidophilus and making soft cheese with the culture is described.

* * *

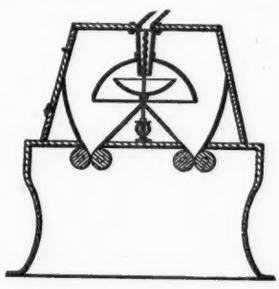
Closure for Bottle—John B. Busch, Sr., Washington, Mo., assignor of one-half to August A. Busch, Sr., St. Louis, Mo. No. 1,706,209. March 19, 1929—A sealing disk made of corn stalk pith to replace the usual cork disks in crown seals.

* * *

Mixing Device—Frederick L. Craddock, New York, N. Y. No. 1,703,099. Feb. 26, 1929—A portable mixer of the propeller type, mounted on a ball and socket universal joint for locking in any position on a tank.

* * *

Centrifugal Feeder for Roller Mills—Alexander Gillespie, Pittsfield, Ill. No. 1,702,341. Feb. 19, 1929—Grain is fed into a rotating spherical segment. Centrifugal force, augmented by suitably shaped deflecting boards, distributes it uniformly along the length of the rolls.



Centrifugal feeder for roller mills

* * *

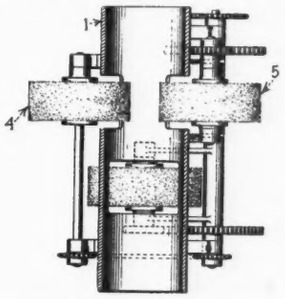
Milk Cooler—Louis Rosenfeld, Baltimore, Md., assignor, by mesne assignments, to Cherry-Burrell Corporation, Chicago, Ill. No. 1,697,696. Jan. 1, 1929—A concentric tube heat interchanger with end couplings on a movable yoke which can be swung to one side when the tubes are to be cleaned.

* * *

Pretzel Stick Forming Machine—G. W. Holtzman, Myerstown, Pa., assignor to Pretzsticks Baking Co., Myerstown, Pa. No. 1,701,850. Feb. 12, 1929—Pretzel stick forming apparatus in which the dough is drawn out into a rod and partially dried before cutting into sections.

* * *

Fish Scaling Machine—Ernest A. Gallison, Watertown, Mass., assignor to Bay State Fishing Company, Boston, Mass. No. 1,692,985. Nov. 27, 1928—



Fish dropped into the casing (1) are rapidly scaled by the rotating brushes (4) and (5). Several pairs of brushes, revolving at different speeds may be used if necessary. One of each pair is movable in order that the brushes may conform to the shape of the fish.

* * *

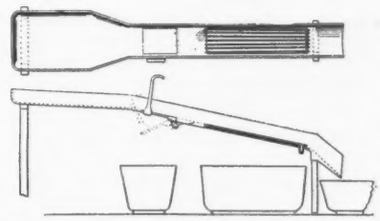
Bread Wrapping Machine—Howard H. Metcalf, Battle Creek, Mich., assignor to Battle Creek Bread Wrapping Machine Company, Battle Creek, Mich. No. 1,703,855. Feb. 26, 1929—A compact wrapping machine of large capacity adjustable to articles of different size. Conveyor, wrapping mechanism, and paper carrier are adjustable to the size of the article being wrapped.

* * *

Mold Prevention Treatment for Flour and Grain—René André Legendre, Paris, France. No. 1,702,735. Feb. 19, 1929—Four or grain is treated with gaseous ammonia or alkali carbonates to raise the pH of the equilibrium moisture to a value of 8 to 10.

* * *

Egg Separator—John G. Daw, San Francisco, Calif., assignor of one-half to Thomas P. Galvin and one-third to John C. Burdick. No. 1,692,931. Nov. 27, 1928.—Broken eggs are allowed to



slide down a metal trough and over a wire grating. The white flows through the grating and the yolk passes off the end of the trough. A trap door ahead of the grating keeps bad eggs or broken yolks from contaminating the whites.

* * *

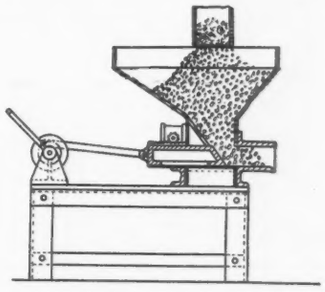
Dextrose from Hydrol—Charles Ebert, Leonia, N. J.; William B. Newkirk, Riverside, Ill.; and Meyer Moskowitz, Spring Valley, N. Y., assignors to International Patents Development Company, Wilmington, Del. No. 1,704,037. March 5, 1929—Hydrol, the mother liquor of purity 65-75 from corn sugar manufacture, is acidified with hydrochloric acid to pH 1.8-2.0 and converted at 45 lb. pressure. The converted liquor has a purity of about 90 and is worked up into dextrose in the usual manner. The finished sugar is light yellow to white.

* * *

Dehydrating Fats by Absorption—Charles V. Zoul, Santa Monica, Calif., assignor, by mesne assignments, to the Celite Company. No. 1,701,092. Feb. 5, 1929—A mixture of calcined gypsum and diatomaceous earth is agitated with the melted fat. The gypsum absorbs the water and the earth adsorbs the water soluble impurities. The dried fat is filtered, the diatomaceous earth making filtration easier than when gypsum alone is used.

* * *

Powder Measuring Machine—James Edward Lea, Manchester, England. No. 1,697,072. Jan. 1, 1929—Material from a hopper flows into a horizontal cylinder



open at one end. A plunger pushes the material out and a revolution counter records the number of strokes of the plunger.

* * *

Removing Stems from Grapes—O. J. Steinwand, San Francisco, Cal., assignor to Sussman, Wormser & Co., San Francisco, Cal. No. 1,700,861. Feb. 5, 1929.—A revolving drum for the re-

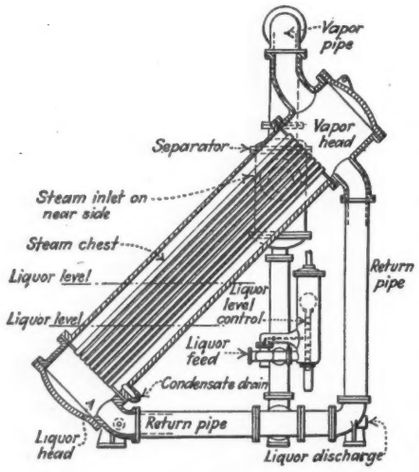
MANUFACTURERS' · NEWS · AND · EQUIPMENT

Seen at the Chemical Show

SEVERAL items of new materials and equipment were on exhibit at the Twelfth Exposition of Chemical Industries, held during the week of May 6, that are particularly interesting to readers of FOOD INDUSTRIES.

Rubalt, a combination of rubber and bitumen, is a new rust-proof and acid-resistant paint, prepared in gray, green, red and black colors, which was shown by Alfred Hague & Company, Inc., of New York.

Seitz bacterial filters of commercial size were in the exhibit of Philip Wirth, Inc., of New York. These are in reality laboratory filters, familiar to all bacteriologists, enlarged to an industrial size and are used for sterilization of liquids by filtration much in the same manner as accomplished in the Zahm & Nagel filters made in Buffalo. The



Struthers-Wells Evaporator

Seitz filters employ a filter sheet, while the Zahm & Nagel filters use the Pasteur-Chamberland candle-type filters.

A line of suspended gyratory sifters made by the Great Western Manufacturing Company, of Leavenworth, Kan., are driven by an overhead motor on a vertical shaft. The shaft, extending down to the screens proper, carries an unbalanced flywheel that, when put in motion, causes the screen to vibrate in a gyratory motion at a high rate of speed. A flexible coupling prevents transmission of the screen motion to the motor shaft. They are made in both batch type and continuous sifters.

Another sifter displayed was the Jigger of the Productive Equipment Corporation, of Chicago, in which the sifting action is vibration brought about by an eccentric shaft revolving in an eccentric tube. By changing the relative eccentricities of the tube and shaft the vibration can be varied from a large amplitude to zero. Also the whole screen can be tilted to obtain the optimum rate of flow of material to secure the most rapid sifting.

A small cylindrical device, 6x10 in., made by the Carbo-Freezer Company, of New York, produces solid carbon dioxide ice while one waits, even if he can wait only 30 seconds. In this brief length of time a 3-oz. cake of solid carbon dioxide is made automatically. The product is of interest not only to laboratory men but also to ice cream vendors, and those interested in frozen fruit or frozen fish may be glad to know of its existence.

The new I. H. V. evaporator of Struthers-Wells Company, of Warren, Pa., has an appearance quite different from the usual design of evaporator and embodies a new application of the inclined-tube principle. The boiling liquid is maintained at a predetermined height by a float control that is located in the line returning from the separator. Evaporation in the tubes causes the liquid to eject out into the vapor head with the high velocity that is characteristic of inclined evaporators. The vapor together with any entrained passes out to a separator from which the liquid is returned via the liquid control line, while the vapor passes into the next effect or into a condenser; the concentrated liquid that separates in the vapor head falls and returns to the bottom of the evaporator, joining the feed line en route.

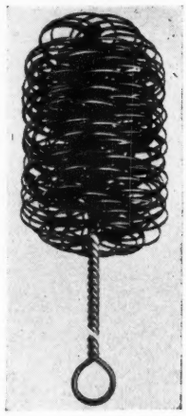
Concentrated liquor is drawn off just before the fresh liquor is added. In operation of the evaporator the feed and draw-off are so adjusted in volume that the desired concentration is reached continuously. It is made in a number of sizes and is used both for evaporating non-crystallizing liquids and for making distilled water, in single, double and triple effect.

Electrically heated equipment in which the heat is generated in the metal wall of the container itself was shown by the National Electric Heating Company. Heavy currents at low potential are used and because the heat is generated in the vessel wall and not in heating coils surrounding it, the temperature rises very quickly. For the same reason much more efficient use of the heat is obtained and the high cost usually associated with electrical heating is considerably reduced. Automatic control enables any desired temperature to be maintained.

Tube and Flue Cleaning Brush

The "Spring Clean" flue and tube cleaning brush manufactured by the Specialty Manufacturing Company, 10698 Berea Road, Cleveland, Ohio, is composed of a number of eccentrically wound circles of flat, tempered wire having square corners. Each wire passes through the twisted wire central support and is firmly secured at that point, the remainder of the wire being free to adapt itself to the shape of the tube to be cleaned.

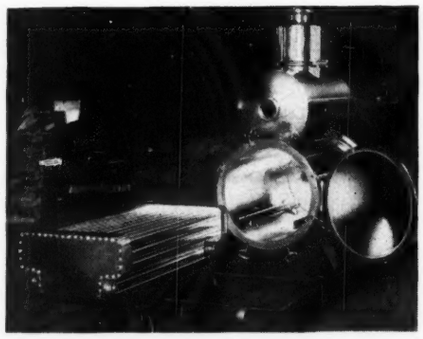
When the brush is thrust into the pipe or flue, the forward pressure causes the outer edges of the flat wire to tilt until their square edges press against the inner surface of the pipes with a scraping action. This action is independent of whether the brush is rotated by hand or by a flexible rotary shaft, or whether it is thrust straight forward.



The brush is made in two types, the first having a five-foot flexible twisted wire handle for heating flues and air ducts, and the second having a shorter and thicker handle from 4 to 8 in. long, for cleaning scales and boiler tubes, and for other jobs on which a flexible rotary shaft is used.

A New Type of Evaporator

Evaporative processes and problems, especially those which necessitate an apparatus in which ease of cleaning and concentration of heating area with a



low hydrostatic head are important, have led to the design of a new type of evaporator by Gus A. Zeitler, of Oakland, Calif. The apparatus is characterized by four essential parts, the boiling chamber, tube assembly, vapor chamber and catchall. A typical small size unit has 40 sq.ft. of heating surface and is capable of an hourly evaporation of 350 lb. of water. The boiling chamber is a 2x4-ft. horizontal cylinder closed by a gasketed, screw-clamp door

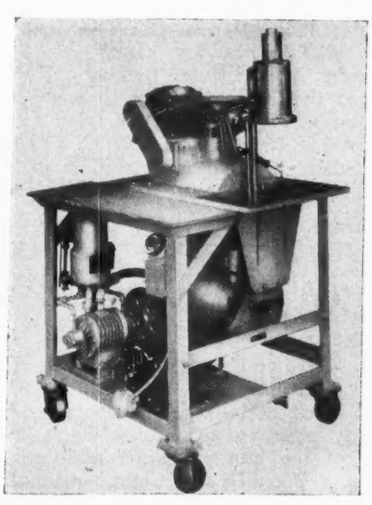
and is mounted on a framework which also carries the tube-assembly car. The closed end carries the connecting pipes for steam and condensate.

The removable heating unit is of the double-pass type, consisting of the two tube headers joined by four horizontal rows of tubes. One header is entirely closed, while the other holds the connectors which fit into sockets on the inside of the end of the boiling chamber—two for steam and one for condensate—which connect the tube assembly with the steam and condensate lines. The header connectors are held in the sockets by means of screws, operated by handwheels, that draw the heater tightly against a thick rubber gasket between it and the shell.

Mounted on the boiling chamber is the vapor chamber—a horizontal cylindrical chamber communicating with it throughout its length. Its ends are equipped with sight glasses only. The shape of the communicating opening aids in overcoming any tendency of the liquid to foam. The vapor chamber is of the same length but of slightly smaller diameter than the boiling chamber. Mounted on top of it is the catch-all, which connects to the condenser and vacuum pump. The feed is at the bottom of the boiling cylinder. The new machine is especially adaptable for evaporation of solutions containing scale-forming substances or solutions where ease of cleaning is essential to good sanitation. It should be useful for production of boiler feed water where space economy and high heat transfer are important and for food products generally.

Vacuum Sealing Machine

A single-bell vacuum sealing machine is a recent offering of the White Cap Company, of Chicago. Mounted on a table truck with self-contained motor



and rotary vacuum pump, it is a portable unit, with a capacity of 20 to 30 seals per minute applied by vacuum to glass or tin containers up to 9¾ in. tall and 4 in. diameter. All operations other than vacuumizing and sealing on this unit are performed manually.

Manufacturers' Latest Publications

Unless stated otherwise in the text, free copies of these publications may be obtained from the manufacturer by readers of FOOD INDUSTRIES *who mention our journal in connection with their request.*

Wire and Figured Glass. The Mississippi Glass Company, 220 Fifth Avenue, New York—A beautifully illustrated catalog, which describes figure and wire glass with specifications and illustrations of each type and suggestions for its use.

Glassine Paper. The Warren Manufacturing Company, 342 Madison Avenue, New York—A folder containing eight samples of glassine paper, plain and waxed, with suggestions for their use.

Stoker. Combustion Engineering Corporation, 200 Madison Ave., New York—Catalog K-2. Illustrations and descriptions of Type K Underfeed Stoker for boilers up to 200 hp. Descriptive Booklet MR-1 illustrates details of construction and typical settings of C-E Multiple Retort Stokers.

Electrical Refrigeration. General Refrigeration Company, Beloit, Wis.—The ABC's of Electrical Refrigeration. A booklet that describes and illustrates all sizes of Lipman Refrigerating Machines. A brief, interesting account of the development of mechanical refrigeration serves as an introduction. Many illustrations.

Diesel Engines. Chicago Pneumatic Tool Company, New York—Bulletin 775. M.W.M. Benz Engines of 225 to 450 hp. are described and illustrated with photographs and drawings of parts and typical installations. Dimensions of different types and a fuel-cost horsepower chart are included.

Automatic Control Valves. The Bristol Company, Waterbury, Conn.—Temperature may be accurately controlled by the automatic valves described in this catalog. Motor and magnet controlled valves for gas, oil, steam and water are described. Descriptions of suitable recording instruments for use in conjunction with the control valve are included. Fully illustrated.

Dried Milk. Douthitt Engineering Company, 100 West Monroe St., Chicago—Dried Milk and Dried Milk Products, a booklet by O. F. Hunziker, gives an outline of the dried milk industry, methods of drying whole and skim milk, and uses for various dried dairy products. Properties of dry milk products and some economic phases of the industry are also discussed.

Refrigeration. The Vilter Manufacturing Company, Milwaukee, Wis.—Bulletin No. 29R. Description and illustration of a twin-cylinder vertical ammonia compressor and a small can ice plant. Bulletin P-28 is an illustrated list of renewal parts for Vilter Corliss engines and horizontal ammonia compressors.

Packaging Machines. National Packaging Machinery Company, 459 Watertown St., Newtonville, Boston, Mass.—Folder illustrating automatic weighing and filling machines, sealers, and package conveyors.

Canning Machinery. Berlin Chapman Company, Berlin, Wis.—Catalog No. 27. Fifty-seven page catalog of canning machinery, including graders, washers, cookers, retorts, etc. Specifications are given and each machine is illustrated. Indexed.

Bottling Machinery. U. S. Bottlers Machinery Company, 4015-31 North Rockwell St., Chicago—Catalog B. Bottle washers and driers; hand, siphon, and vacuum fillers; capping and labeling machines are described and specifications or capacities given. Fully illustrated.

Sealing Machine. H. R. Bliss Company, Inc., Niagara Falls, N. Y.—Leaflet illustrating a new, top, automatic, gluing and sealing machine for fiber and corrugated shipping cases.

Nickel Cooking Equipment. Lee Metal Products Company, Philipsburg, Pa.—Booklet and leaflets describing nickel utensils and steam jacketed kettles of trunnion and stationary types. Dimensions, capacities and prices of standard styles are given.

Electric Brand Irons. Edwin L. Wiegand Company, 422 First Ave., Pittsburgh, Pa.—Bulletin C-110. A folder describing Chromalox Electric Burning Brands for marking wood, leather, textiles and food products. Typical machines are illustrated and prices are given.

Tying Machines. B. H. Bunn Company, 7329-31 Vincennes Ave., Chicago—Folder describing machines for tying candy boxes, cartons, bundles and packages.

Refrigeration. Frick Company, Waynesboro, Pa.—Leaflet illustrating Frick Refrigeration Machine and typical installation.

Vacuum Pan. Pfaudler Company, Rochester, N. Y.—Nielsen Survey on a Pfaudler Model B pan used in making strawberry, raspberry and pineapple preserves.

Filter Char. Industrial Chemical Sales Company, 230 Park Ave., New York—Booklet dealing with the applications of activated carbon (Nuchar) to vegetable and animal oil refining.

Colloid Mills. The Travis Colloid Research Company, Inc., 110 Broad St., New York—The new and improved Hurrell Colloid Mills are described at length and their applications given. Specifications and illustrations of two sizes are included.

Scales. Exact Weight Scale Company, Columbus, Ohio—The scale dial of the Exact Weight Scale has a single index which marks the exact weight. The movement of the scale pointer is much exaggerated for over- and underweights. Catalog describes models suitable for flour mills, bakeries, and confectionery manufacturers. Profusely illustrated.

· NEWS · ITEMS ·

Eighteen Grain Companies in Corn Products Purchase

The Corn Products Refining Company has purchased a group of eighteen New England grain companies, including the Charles M. Cox Company, Eastern Grain Company, St. Albans Grain Company, Cunningham Grain Company, Crosby Milling Company, and the Cutler Company. A holding company, to be called the New England Corn Products Company, will control the combined purchases. The new company will issue 40,000 shares of no par value 7 per cent cumulative preferred stock and 160,000 shares of no par value common stock. Of the latter, the Corn Products Refining Company will hold 102,000 shares, as well as a portion of the preferred.

The gross business of the combined companies was approximately $25,000,000 in 1928. The new company will turn out approximately 35 carloads of dairy and poultry feeds daily, from four large milling plants.

Wheat Prices Drop to Below Dollar Level

In the face of a possible carry-over of a round 350,000,000 bushels of wheat into the new crop and a possible production of 640,000,000 of winter wheat this season, prices have slumped from the usual $1.30 per bushel level to below $1 for July delivery wheat in Chicago. Recently July wheat closed at Chicago at 99⅞, in Minneapolis at 98⅝, and at Winnipeg at 1.09⅜. About the only possibility for any upward price movement rests in serious damage to the winter and spring wheat crops of the United States, a decided shortage in Canada or a small crop in Europe, none of which are in sight at the present time.

It is the belief of grain traders at Chicago and other important markets that the only possibility for better prices to the wheat growers of the grain raising countries, Argentina, Australia and the United States, is to raise smaller crops. Both Canada and Argentina are engaged in a price cutting war in foreign markets against the competition of American wheat and in view of the large known surplus there is little to induce foreign buyers to purchase more than is absolutely necessary to keep their mills operating.

Following a conference of railroad executives in Washington on May 2 which included Presidents Crowley of the New York Central, Willard of the Baltimore & Ohio, Atterbury of the Pennsylvania, Dice of the Philadelphia & Reading, and Loomis of Lehigh Valley, announcement was made of a reduction in freight rates on wheat from the Middle West to seaboard ports. This is in an effort to move some of the large surplus stocks piling up and to avoid too large a carry-over into the new crop.

An announcement by the Department of Agriculture said in part:

"These reductions will approximate 2c. per bushel on wheat moving from Buffalo, 4c. from Chicago and 5c. from St. Louis. The reductions will be temporary and will expire on Sept. 30, 1929.

" . . . Similar action is expected from Western railroads."

Stewart-Curtis Packers, Inc., Organization

The Alexander B. Stewart Organizations, Inc., Los Angeles, and the Curtis Corporation, Long Beach, Calif., have combined to form the Stewart-Curtis Packers, Incorporated. The combined capitalization is $3,000,000. The new company will have general offices at 315 West 9th Street, Los Angeles. District offices will be located in the Chanin Building, New York, and at 30 West Washington Blvd., Chicago. Officers of the Stewart-Curtis Packers are Alexander B. Stewart, president; H. F. Carnahan, vice-president; Dr. E. E. Stone, vice-president; J. M. Logan, treasurer. Directors are: Rex W. Laws, James W. Reagan, James Wood. The new company will continue the operation of the old Curtis Corporation's canning plant at Long Beach, engaged in canning tuna, sardines, olives and spinach.

COMING EVENTS

JUNE

2-4—South Dakota Bakers Unit, Watertown.
3-6—National Confectioners Association, West Baden, Ind.
3-8—Annual Convention, Association of Operative Millers, St. Louis, Mo.
6-8—Annual Convention, American Feed Manufacturers Association, French Lick, Ind.
10-12—Pennsylvania Bakers Association, Bedford Springs, Pa.
17-19—Potomac States Bakers Association, Virginia Beach, Va.
18-20—Associated Bakers of Minnesota, St. Paul.
18-20—National Macaroni Association, New York.
20-22—American Society of Refrigerating Engineers, State College, Pa.
24-26—Ohio Bakers Association, Toledo.
—American Dairy Science Association, Washington, D. C.

AUGUST

17—Missouri-Illinois District, Association of Operative Millers, St. Louis.

SEPTEMBER

7—Texas-Oklahoma District, Association of Operative Millers, Fort Worth.
9-13—American Chemical Society, Minneapolis.

Maine Declared Free of Bovine Tuberculosis

As a result of 12 years of systematic tuberculin testing, during which 650,000 tests were applied, the entire State of Maine has been declared free of bovine tuberculosis, by the Bureau of Animal Industry, U. S. Department of Agriculture. By this recognition, effective May 1, Maine becomes the second state with entirely tuberculosis-free cattle. North Carolina was the first, having been declared free Oct. 1, 1928.

The Bureau of Animal Industry points out that the suppression of bovine tuberculosis in Maine has an important bearing on the eradication of the disease in the remaining New England States, since Maine sells dairy cattle to her less fortunate sister states, where the percentage of tuberculosis infected cattle is higher than it was in Maine.

American Food Manufacturers To Exhibit at Barcelona

At least four manufacturers of food in the United States have leased space at the International Exhibition at Barcelona, Spain, according to M. Ventura, official delegate to the United States from Barcelona. The list includes Life Savers, Inc., of Port Chester, N. Y.; Bunte Brothers, of Chicago; the Kellogg Sales Company, of Battle Creek; and the Wrigley Company, of Chicago. Alfonso XIII, King of Spain, is honorary president of the exhibition. It opened in May and will continue until December.

Bankers Back California Raisin Growers

Bankers of California have agreed to back with $20,000,000 in cash the Federal Fruit Stabilization Corporation recently organized to stabilize the marketing of the San Joaquin Valley raisin crop. Donald D. Conn, managing director of the California Vineyardists' Association stated that the corporation would pay raisin producers the $20,000,000 this year if they would agree to deliver their 1929, 1930 and 1931 crop to the stabilizing body. Three and one-half cents a pound and up will be paid to growers.

Papers of Interest to Food Manufacturers Presented at A. C. S. Meeting

FOOD CHEMISTS who attended the Columbus meeting of the American Chemical Society, on April 29 to May 3, heard some twenty odd papers presented at the session of the Division of Agricultural and Food Chemistry, some of which are of particular interest to food manufacturers, among them the following:

"Effects of Variations in Ingredients on the Color of Chocolate Cake," by Emily Grewe and E. O. Whittier. Milk has no marked effect upon the color of chocolate cake unless it is sour, the cake becoming lighter colored as the acidity of the milk increases. The darkness of the chocolate and the amount used affects the color. Salt, baking powder, and the color of eggs have no marked effect. The most important factor affecting the color of chocolate cake is the pH as affected by the sodium bicarbonate added. When the pH is above 7 the color darkens readily and the flavor is affected.

"Transparent Emulsions of Some Essential Oils" was covered in a paper by R. E. Lineham and W. F. Whitmore, Polytechnic Institute, Brooklyn. Essential oils do not evaporate from an emulsion as rapidly as the pure oil or oil from an alcoholic solution. By using a mixture of invert sugar and sucrose a solution was prepared with the same refractive index as the essential oil in question. Emulsions of essential oils in such a sugar solution were transparent and stable for a long period of time. Peptizing agents such as gelatin, gum tragacanth or agar agar also were used. Gelatin (0.25 per cent) gave the best results and made it possible to make emulsions containing 15 per cent essential oil. Passing such emulsions through a separator at 2,000 r.p.m. did not separate the oil.

"Acetone Dicarboxylic Acid as a Leavening Agent" received attention by E. O. Wiig, University of Wisconsin. This acid undergoes complete decomposition into CO_2 and H_2O in 45 minutes at 60 deg. C. After using it as a leavening agent in a cake no acetone was found. Acetone boils at 58 deg. C. A baking powder consisting of 75 per cent starch and 25 per cent acetone dicarboxylic acid contains 15 per cent carbon dioxide. Such a baking powder held in a warm place for 45 days showed a reduction of CO_2 from 14 per cent to 13.69 per cent.

"Home Canning and Commercial Canning Contrasted in Their Effect on Vitamin C of Pears," was the name of a paper by Martha M. Kramer, Kansas Agricultural Experiment Station; Walter H. Eddy, Teachers College, and E. F. Kohman, National Canners Association. Kieffer pears and Bartlett pears canned commercially showed no apparent loss of vitamin C in contrast with home canned pears in which the destruction of vitamin C was almost complete by the open-kettle method and rather large by the cold-pack method. Even when no particular pains were taken to remove oxygen beyond those common in commercial canning practice, the loss in vitamin C was not great, 20 to 30 grams of canned pears being the approximate equivalent of 15 to 20 grams of raw pears. Allowing the Kieffer pears to ripen and mellow before canning resulted in a commercially canned product in which the vitamin C was appreciably lower. The vitamin C content of canned Bartlett pears was approximately that of the canned ripened Kieffer pears. Bartlett pears, raw or canned, are relatively low in vitamins A and B.

A. E. Perkins, Ohio Agricultural Experiment Station, took for his subject "A Formula Expressing the Relation Between Fat and Protein in Normal Milk." Curves obtained by plotting the average fat content of various groups of milk against the average protein content of the same group are straight lines. The formula derived from the author's data may be stated as follows: $P=2.78+0.42\ (F-2.78)$, where P is the percentage of protein and F is the percentage of fat. A study of the probable errors involved in the formula is included.

In a paper entitled, "The Potato as an Index of Iodine Distribution," Roe E. Remington, South Carolina Food Research Commission, showed that in the State of South Carolina the iodine content increased, with the exception of a very narrow coastal region, as the distance from the sea was increased. This was taken to mean that the spray from the ocean increased the iodine content for a short distance in shore, but that the real source of iodine over the state generally was the underlying granitic rock. The following figures in parts per billion are given for the iodine content of potatoes: Idaho, 110; Maine, 195; Michigan, 94; Minnesota, 86; South Carolina, 211.

Other papers presented included: "A Study of the Official Method for the Polarimetric Determination of Lactose in Milk," E. S. Almy, Ohio State University and "Some Physical and Chemical Properties of Hard and Soft Wheat," R. H. Carr, Purdue University.

Steel Tank Merger

The Pressed Steel Tank Company, Milwaukee, Wis., has purchased the assets of the Seamless Steel Products Corporation, also located in Milwaukee.

The Seamless Steel Products Corporation manufacturers cylinders, tanks, Kantainers, and other seamless steel products. The business will be operated by the Pressed Steel Tank Company as a wholly-owned subsidiary. There will be no change in the personnel of either organization for the present.

Gorton-Pew to Produce Frozen Fillets

The Gloucester Ice & Cold Storage Company has been sold to the Gorton-Pew Fisheries, of Gloucester, Mass. The Gorton-Pew company intends to install one of the available quick freezing processes in the new plant for the production of frozen fish fillets.

The Consumers and Producers Foundation of America

As stated in the foreword, the objectives of the Consumers and Producers Foundation of America are to increase the earnings and buying power of the nation and to reduce preventable sickness and poverty. Activities will be directed through a nation-wide program dealing with the largest item of family expense and the basic factor in human energy—food. As at present planned, the work will consist of the promotion and dissemination of knowledge to the consuming public, the trades and industries.

Among the first steps to be taken will be a National Food Conference, at which will be organized a National Commission on Food Standards and Nutrition, this commission being the basis upon which the Foundation will be erected.

As is indicated by the schematic chart describing its formulation more clearly than by the name, apparently the Foundation will represent the consumers of America somewhat more particularly than it will the producers of foodstuffs although all manufacturers in the food industries will be invited to participate.

It is intended to take full advantage of co-operation, simplified practice, standardization and other instrumentalities of progress that are at present so much in the public mind, the fundamental purpose being to permit the consumer to buy, through the ordinary channels of trade, the highest possible quality food at the lowest possible price commensurate with such quality.

The protagonist of the Foundation is Wilbur C. Phillips, a social engineer who has served as secretary of the Milk Commission and as general executive of the National Social Unit Organization, which some years ago conducted an experiment in community buying at Cincinnati. Those who have assisted him through indorsement, consultation or financial aid constitute a very impressive list of names, comprising food chemists, dietitians, sociological workers, economists, bankers, publicists, and advertising men and women. The president is F. M. Feiker, managing director of the Associated Business Papers of New York.

San Joaquin Bakers Combine

The San Joaquin Baking Company, Fresno, Calif., has purchased the entire holdings of the Sunshine Baking Company of the same city.

Smoot-Hawley Bill Submitted to Congress; Amendments Seem Inevitable

By Paul Wooton
Washington Correspondent

SO MUCH dissatisfaction has been aroused by the agricultural schedule of the tariff bill that the benefits which it carries are likely to be delayed or even lost to the farmer. As this is written, a determined effort is being made to attach the debenture plan to the tariff bill. If that plan should go through the bill would face almost certain veto.

The bill, as originally brought out by the Ways and Means Committee, was a disappointment to many of the administration leaders, who felt that the committee yielded to many changes in the bill which could have been avoided at this time, thereby carrying out more accurately the original intention of a very limited revision.

The dairy industry stands to benefit very materially from the increases allowed but is in a fervor of protest because more was not allowed. The fresh vegetable growers were given increases of 100 per cent and above. They are demanding more. A great drive is under way to get hides on the dutiable list with all its wide range of compensatory rates. Determined campaigns are under way to secure higher rates for live cattle, blackstrap molasses and other commodities of less general importance, which include such products as casein, flax, tobacco, figs, powdered skimmed milk and fruits.

The farmers also are fighting for decreases on cement, shingles and numerous other products of which they are large consumers. While their organizations are supporting the sugar duty, there is evidence that a large number of the farmers are not in sympathy with that course.

Farmers to Ask Higher Rates

As a matter of campaign strategy some of the efforts to obtain increases will be made when the bill is before the Senate, where, it is their belief, some of the principal efforts will be made to secure reductions. At that time it is expected that the White House will turn thought in that direction. One of the fights that will be staged in the Senate will be directed toward securing higher duties on cheese. The dairy industry is not pleased with the departure by the House committee from its recommendations but it is very likely that the Senate, too, will be opposed to the classification of cheese in such a way as to be directed principally at particular countries.

The fig growers are basing their arguments for tariff increase on costs growing out of disease control. The inroads of disease on this crop have been so great that total production has decreased, despite a fourfold increase in acreage. Many members of Congress believe that it would be better to appropriate money directly for the study and control of fig diseases, rather than leave this task entirely to the industry itself. Domestic potato growers apparently have demonstrated to the satisfaction of many members that they must have higher rates to meet Canadian competition. The proposal of 2c. more for powdered skimmed milk seems to be meeting with favor. Unless this is done, it is argued, Holland is in a position to furnish a large quantity of this material, which finds a ready market in the American baking industry.

Now that members of the Ways and Means Committee are in a position to discuss what transpired in their executive sessions, it is learned that the proposed duty on bananas never was considered seriously. Many jocular things were said about far-fetched competition but they failed to be consistent in many similar cases. Brazil nuts constitute an example. Chairman Hawley argues that these nuts are sold in mixtures and therefore should be dutiable along with the nuts that are raised in this country. Some of the apple growers are pointing out that bananas are a part of the mixture in a fruit cocktail. The discussion over the proposed increase on garbanzos has revealed the fact that three-fourths of our apparent imports of this pea has been passing out of the country as a re-export.

Phillipine Sugar on Free List

Sugar is in a peculiar position, due to the fact that no way has been devised whereby the domestic industry can be made the chief beneficiary. The administration is opposed to opening up the whole question of Philippine independence. If duties were levied against the products of that island it is recognized that the issue would have to be dealt with immediately. The sugar schedule, as reported out by the Ways and Means Committee, is expected to stimulate Philippine production greatly. The benefits to the domestic industry, it is contended, will be confined to a limited period, as the transportation cost from the Philippines to New York is less than the cost from the domestic sources of supply to the New York market. It is apparent that powerful influences will be brought to bear from this time forward looking to the independence of the Philippines. The influence of the domestic sugar producers will be augmented by the powerful group anxious to secure a duty on coconut oil.

While there is objection to the spice paragraph on the basis that few of these materials are produced in this country there is no objection to the prohibitive duty on ground spices. It is felt that unless spices are ground in this country under the American conceptions of sanitation and fair dealing there can be no assurance as to the composition of such an import.

The increased duty on grapefruit apparently is in the interest of Porto Rico. The Cuban product and that of Porto Rico came on the market at about the same time. The duty is expected to stimulate production of that fruit on the American island.

Credit is being given very generally to the committee for the work it did on the administrative features of the bill. While there is partisan objection to the delegation of more authority to the President and to the Tariff Commission, there is general recognition of the benefits which thus may be secured.

The bill as reported by the Ways and Means Committee is so much less fearsome than the requests submitted to the committee that there has been some recession in the feeling abroad. Not realizing that the requests made of the committee were likely to be disregarded in large part, many countries were on the verge of initiating retaliatory measures. While there still are some sore spots abroad the danger of retaliation has decreased measurably.

Proposed Tariff Rates

The main tariff rates on foodstuffs in the Smoot-Hawley tariff bill are given below. Duties are given in cents per pound unless otherwise indicated. Rates given in percentages are ad valorem duties. Rates proposed by various manufacturers and trade associations were given in the March, 1929, issue of Food Industries.

1. Live stock and meats: beef or veal, 6c; sheep, lambs and goats, $3 each; mutton and goat meat, 5c.; lamb, 7c.; swine, 2c.; pork, 2½c.; bacons and hams, 3¼c.; lard, 3c.; lard compounds and substitutes, 5c.; reindeer meat, venison, and other game, 6c.; meats not specifically provided for, 6c., but not less than 20 per cent ad valorem.

2. Dairy products: milk, whole, fresh or sour, 5c. gal.; cream, 48c. gal.; skim milk and buttermilk, 1¾c. gal. (skim milk over 1 per cent butter fat dutiable as whole milk); condensed or evaporated milk, unsweetened 1.4c., sweetened 2¼c., all other 2c.; dried whole milk, 4¾c.; dried cream 10½c.; dried buttermilk, 1½c.; malted milk and milk substitutes, 30 per cent; butter, oleomargarin and butter substitute, 12c.; cheese and substitutes 7c. and not less than 35 per cent ad valorem.

3. Poultry: Live birds, chickens, ducks, turkeys and guineas, 6c.; baby chicks or poultry, 4c. each; dead birds, chickens, ducks, gees and guineas, 8c.; turkeys, 10c.; all others, 10c.; all prepared and preserved poultry products not specifically provided for, 10c.; eggs, in the shell, 10c. doz.; frozen or otherwise prepared, 8c.

4. Grains: buckwheat, 25c. cwt.; corn, 25c. bu.; macaroni, noodles, etc., containing egg products, 3c.; rice, paddy or rough, 1¼c.; brown, 1½c.; milled, 2½c.; broken and rice meal, ⅝c. (sieve

specification to prevent mixtures with whole rice entering as broken); wheat, 42c. bu.; wheat flour, semolina, etc., $1.04 cwt.; bran shorts, 10 per cent.

5. Fruits: dried apricots and cherries, 2c.; cherries, sulphured or in brine, with stems and pits, 5½c.; stems or pits removed, 9½c.; maraschino, candied, etc., 5½c. plus 40 per cent; fruit, candied or otherwise preserved, 8c.; orange, grapefruit or lemon peel, 8c; citron or citron peel, 6c; grapefruit, 1½c.; olives, in brine, ripe, 30c. gal., dried, ripe, 5c.; pineapples (crate changed from 1.96 cu. ft. to 2.45 cu. ft.), 35c. crate; in bulk, 1⅛c. each.

6. Vegetables, fresh and prepared: beans and cowpeas, green, 3½c.; dried, 2½c., in brine or preserved, 3c.; mushrooms, 60 per cent; truffles, 30 per cent; peas and chickpeas or garbanzos, green, 2c., dried 1¾c., split, 2½c.; onions, 1¾c.; garlic, 1½c.; tomatoes, natural, 3c., prepared or preserved, 25 per cent; turnips and rutabagas, 25c. cwt.; vegetables in natural state, peppers, egg plants, cucumbers, 3c.; squash, 2c.; all others not specifically provided for, including crude horseradish, 50 per cent ad valorem.

7. Nuts: almonds, unshelled, 5½c., shelled, 16½c.; blanched, mandalonas and imitation, 18½c.; paste, 18½c.; cream or Brazil nuts, unshelled, 2c.; shelled, 6c.; filberts, unshelled, 5c.; shelled, 10c.; peanuts, unshelled, 6c.; shelled, 4c.; blanched, salted, preserved, peanut butter and prepared forms not specifically provided for, 7c.; walnuts, unshelled, 5c.; shelled 15c.; blanched 15c.; edible nuts, not specifically provided for, unshelled 5c., shelled, 10c.

8. Seeds: flaxseed, 56c. bu.; soy beans, 2c.

9. Condiments: Mustard seeds, whole, 2c.; capsicum, unground, 5c.; ground, 8c.; paprika, unground, 5c.; curry and curry powder, 5c.

10. Chocolate and cocoa: (17½ per cent but not less than 2c.) value not over 12c. lb., 2c.; 12c.-24c. lb., 2c. plus 10 per cent; 24c.-35c. lb., 4c. plus 10 per cent; over 35c., 40 per cent ad valorem.

11. Sugar and sugar products: sugar, basic rate against Cuba, 2.40c.; molasses, edible, basic rate, 3.3c. gal., plus 0.6c. for each point; blackstrap (equivalent basic rate), 2c. gal.; maple sugar, 7½c.; maple syrup, 5c.; dextrose, not above 99.7 per cent, and dextrose syrup, 2c.; sugar cane, in natural state, $3 ton.

12. Miscellaneous: lemon, lime and sour-orange juice fit for beverage purposes, 70c. gal.; edible gelatin (in value less than 40c. lb.), 20 per cent plus 5c.; potato starch, 2½c.; edible palm kernel oil, 1c.; sesame oil, 3c.

13. Free List: licorice root; argols, tartar and wine less than 90 per cent potassium bitartrate; citrons and citron peel, crude, dried, or in brine.

Not satisfied with the proposed duty increase on potato starch from 1¾c. to 2½c. per pound, farming interests want sago and tapioca taken off the free list and made dutiable at the same rate as competitive substitutes. Poultry raisers have received ample protection on shell eggs but want higher rates on frozen and dried. They claim that the establishment of a dried egg industry in this country has been studied and found impossible without further tariff support against China.

Although upward revisions are applied through the glassware paragraphs, ordinary bottles, jars and other containers used in food packing stand at the old rates.

The Democratic Attitude

The minority views submitted by Representative Hull, a Democratic member of the Ways and Means Committee, have made a very considerable impression in the House. In that report he advocates a revision downward of the existing law to a level of moderate or competitive rates, "rates which would guard against domestic monopoly on the one hand and abnormal imports against an efficient industry on the other."

Other extracts from the minority report follow:

"Our productive capacity today is 25 per cent in excess of our ability to consume. High tariffs cannot save us from growing surpluses. If American plants today were unloosed at full production, they would flood all domestic markets within 90 days. Our neglect to develop foreign markets for surpluses is the one outstanding cause of unemployment. Those who champion our system of super protection do not pretend that tariffs will aid exports for the patent reason that nations cannot sell more if each tries to buy less. High tariffs shut off our exports almost to the extent that they shut out imports. Such tariffs arouse hatred, controversy, retaliation, and drive trade in the opposite direction. We cannot extend foreign markets by raising domestic costs. Every tariff rate is an injury to export trade.

"It was under American leadership that a network of tariffs has been built up in Europe since the war, with such results as diminished production, wasteful use of capital, uneconomic distribution, serious trade controversies, and fatal handicaps to the restoration of international trade. America now should take the lead toward lower tariffs and liberal trade policies. The conclusion is inescapable that this nation, faced with large and growing surpluses, can advance its economic welfare to a far greater extent by developing these wonderful foreign trade opportunities than by rejecting them for the sake of an airtight tariff structure and the trifling increase of home trade resulting."

Mayonnaise Association Moves

The Mayonnaise Products & Manufacturers Association of America, Inc. announces the removal of its offices to 1500 Walnut Street, Philadelphia.

Baker-Perkins Company Acquires New Lines

The products of the Gottfried Automatic Flow Control Company, the Package Machinery Company, and the Levigne Bread Wrapping Machine have been added to the equipment manufactured and sold by Baker-Perkins Company.

Dry Milk Institute Meets In Chicago

The American Dry Milk Institute held its Fourth Annual Meeting at the Palmer House, Chicago, April 25 and 26. There was a large attendance of manufacturers and selling agents of dry skimmed milk and friends of the industry from all parts of the country, from the Atlantic to the Pacific coasts. Informal discussion of problems of special interest, including "Human Food Sales," "Quality and Standards," and "Costs of Manufacture," were a feature of small group luncheons held on Thursday.

The executive committee for the coming year was elected and organized as follows: C. E. Gray, chairman: Walter Page, vice-chairman; F. J. Metzger, secretary-treasurer; R. R. Gotley; H. R. Leonard; H. E. Van Norman, president; and F. A. Wills. Roud McCann is director and active manager of the Institute, which has headquarters at 160 North La Salle St., Chicago.

New Quarters for Federal Laboratories in Northwest Fruit Section

Up to this time adequate laboratory facilities have been lacking for the three laboratories of three different units in the U. S. Department of Agriculture in the Northwest fruit section—two of the Bureau of Plant Industry and the other of the Bureau of Chemistry and Soils. After July 1 they will be housed with the State Inspection Laboratory in a building now being constructed in the Columbia River valley by county authorities at Wenatchee, Wash. The work of these laboratories during the past 15 years has had to do with the control of fruit diseases and fruit pests, and the solution of various handling and storage problems.

Libby Absorbs Dickenson

Dickenson & Company, canners of corn, peas, pumpkin and string beans under the Woodford brand, with three large plants located at Washington, Eureka and Morton, Ill., have been merged with Libby, McNeill & Libby, Chicago. It is understood that the Dickenson unit probably will continue its identity with no change in personnel.

Birdseye Quick Freezing Process Sold to Postum

Postum Company, Inc., and Goldman Sachs Trading Corporation have purchased all of the patent rights to the Birdseye quick freezing process. General Sea Foods Corporation, Gloucester, Mass., which has been using the process for about two years in the refrigeration of fresh fish and distribution of them to many parts of the world, is included in the sale. A company known as Frosted Foods, Incorporated, about to be organized, will control the process. Postum Company will own a majority of the stock in Frosted Foods, Incorporated, and will direct its operations. The Birdseye process for the quick freezing of fish was described in the October, 1928, issue of FOOD INDUSTRIES.

Portland Grain Exchange Now a "Contract Market"

The Portland Grain Exchange, Portland, Ore., was designated a "contract market" for future trading in wheat, by an order of the Secretary of Agriculture, signed April 30. Portland is the second city of the Pacific Northwest to have such a market. The Seattle Grain Exchange was designated a "contract market" in January, 1926.

Mediterranean Fruit Fly Invades Florida

Within the last two months, fruit growers of the United States have been startled by the announcement of the appearance of the Mediterranean fruit fly in Florida. Four counties constitute the infested area so far and strenuous efforts have been and are being made to prevent the spread of the pest to other sections. Alabama and Georgia have declared embargoes on Florida produce as have Spain and the Bahama Islands. If the infestation spreads, no doubt other Southern states, as well as countries raising tropical fruits, will do likewise.

The United States has been extremely fortunate in not having had before an invasion of this minute but devastating insect which has ravaged the fruit growing business of Bermuda, the West Indies, Hawaii, South America, South Africa, the South Sea Islands and the Mediterranean countries. It is interesting to note that in a volume of approximately 1,000 pages published last year, devoted to economic entomology of the United States, the Mediterranean fruit fly is not mentioned.

Dr. Charles A. Campbell, entomologist of Rollins College, Winter Park, Fla., in describing the insect and its life history says:

"The eggs are laid in the ripening fruit and when hatched the larvae work into the flesh.

"After a number of days of feeding, the fruit, partially decayed, falls to the ground. The larvae, escaping, burrow into the soil, there to undergo metamorphosis, emerging soon as full-fledged insects ready to produce a new generation. The vulnerable stage is that in the fallen, infested fruit, which is gathered and effectually destroyed."

Its life cycle, from egg to adult, varies from fifteen days to a month according to the Bureau of Entomology, so it takes little imagination to visualize the damage possible from its depredations if not checked. A parasitic enemy of the fly is said to have been introduced into Hawaii.

The seriousness of the situation has been recognized by Congress, which, at the request of President Hoover, has transferred $4,250,000 from a $5,000,000 fund established to fight the boll weevil in Texas to a fund for fighting the Mediterranean fruit fly in Florida. As control measures rigid quarantine of the infested areas has been established and infested fruits destroyed as rapidly as found.

Rum-runners from the West Indies are blamed for the present invasion, for it is thought that insects may have come in on straw wrapped around the illicit cargoes and afterward discarded on Florida soil. If this is true outbreaks may be expected at other places on the Atlantic and Gulf coasts. This method of invasion plus the fact that the fly is not averse to living, temporarily at least, on fruits and vegetables other than the citrus fruits, makes the situation in the Southeastern states a disturbing if not alarming one.

Carnation Milk Expands in West

Ten dairies in Portland, Ore., and five in Seattle, Wash., besides an ice cream plant in the latter city, have been purchased by the Carnation Farm Products Company, a subsidiary of the Carnation Milk Products Company. The ten Portland plants furnish about 38 per cent of that city's milk supply.

The Carnation company will continue the retail distribution of milk and will also manufacture cheese and butter. Surplus milk will be shipped to the company's condenseries in Oregon and Washington.

Officers of the company are: E. A. Stuart, Seattle, president; P. G. Kinger, Seattle, vice-president and treasurer; A. M. Work, Portland, vice-president; W. N. MacBriar, vice-president; K. I. Ghormley, secretary.

New "Dry-Ice" Production Centers Established

The Dry-Ice Corporation, in addition to its manufacturing plants at New York, Albany, and Chicago, is now manufacturing in plants located at: Atlanta, Ga.; Cambridge, Mass.; Cincinnati, Ohio; Jacksonville, Fla.; Long Island City, N. Y.; Kansas City, Mo.; Minneapolis, Minn.; Niagara Falls, N. Y., and St. Louis, Mo. Warehouses have been established at Buffalo, Cleveland, Detroit, Pittsburgh, and Philadelphia. The Liquid Carbonic Corporation has contracted for a long term to supply pure carbon dioxide from several of its producing units throughout the country for the manufacture of dry ice. The Carbide & Chemicals Corporation, a subsidary of the Union Carbide & Carbon Corporation, has contracted to supply the Niagara Falls plant with CO_2. A 60-ton-per-day dry-ice plant has been in operation at Niagara Falls since May 15.

Wheat Protein Tests Before Senate

The Senate Agriculture Committee has reported favorably the Federal-State Protein Testing Act, providing for a test to determine protein content in wheat. The same measure passed the Senate last session, but was held up in the House. The bill provides for the establishment of federal laboratories in various states and appoints the Department of Agriculture to carry out its provisions.

Utah Ice Cream Plants Sold to Western Dairies

The Keeley Ice Cream Company and the Crescent Ice Cream Products Company, both of Salt Lake City, Utah, have been purchased by Western Dairies, Inc., of Los Angeles, Calif. The combined companies, to be known as the Midwestern Dairy Products Company, will have an annual output of approximately one million gallons of ice cream. It will also manufacture soda fountain products, jellies, jams and cold packed berries. The plants taken over are located in Salt Lake City, Ogden, Provo, and Spanish Fork, Utah, and in Pocatello and Boise, Idaho.

California Juice Grapes to be Frozen

The storage of juice grapes in the frozen state has been the subject of considerable experiment in California in order to relieve the acute situation which has resulted in the last few years from overproduction of this fruit. Last October a quantity of grapes was picked, frozen in barrels, and held in this state throughout the winter. Late in March three tons of these grapes were shipped as a test to the Department of Commerce Offices in the Far East. It is said that, for juice purposes, the grapes are as good or better as on the day they were packed.

Arrangements have also been made to store a large part of this year's crop in four cold storage houses in San Francisco instead of moving the whole crop to the market as fast as it is picked.

It is hoped that this method will avoid flooding the market with fresh grapes and that a period of high prices will prevail for a longer time than is ordinarily the case.

Postum Inc. Becomes General Foods

Directors of Postum Incorporated have voted to change the name of the company to General Foods Corporation and will submit the proposed change to stockholders for approval next month. In view of the diversity of products which Postum now controls it was felt that the old name was not broad enough to cover all of its activities.

Jervain Acquires New Units

The Jervain Corporation, of New York, recently purchased the Terminal Ice & Cold Storage Company, of Hagerstown, Md.; the ice division of the Federal Milling & Refrigerating Company and the ice business of H. E. Bester & Company for a consideration of approximately $1,000,000.

American Dairies Expands

The American Dairies, Inc., formed last Fall at Kansas City, Mo., by bringing together the extensive Chandler interests and the DeCoursey companies, operating dairies, creameries, and ice cream companies in Kansas, Nebraska and Missouri, are now reported as about to take over the Arctic Dairy Products Company, in Kansas City.

Acquires Another Plant

The Minnesota Valley Canning Company, with main offices at Le Sueur, Minn., announces the purchase of the common stock of the Blue Earth Canning Company, Blue Earth, Minn. The purchaser obtains a sixth plant, having a capacity of 100,000 cases of canned corn, in addition to the other plants located at Le Sueur, Watertown, Winstead, Cokato, and Montgomery.

Liquid Carbonic Issues Additional Stock

The Liquid Carbonic Corporation has offered to stockholders 44,448 shares of unissued capital stock at $70 a a share in the ratio of one new share for each six now held. Funds from the sale of stock will be used to reimburse the company for present and future expenditures in its expansion program. This includes the purchase of the General Carbonic Company, the O. & J. Machine Company, the National Labeling Machine Company, a quarter interest in the Dry Ice Corporation, and a half interest in a company which is the only producer of CO_2 in Cuba.

Important Discussions by Cereal Chemists

Abstracts of four important papers presented at the Fifteenth Annual Convention of the American Association of Cereal Chemists on May 6, at Kansas City, Mo., are presented to our readers:

THE SIGNIFICANCE OF ACIDITY IN FLOUR WITH REFERENCE TO FLOUR SPECIFICATIONS. Report of the Committee, F. A. Collatz, Washburn-Crosby Co., chairman. Various methods of determining acidity in flour and cereal products are reviewed. Twenty samples of flour were submitted to the committee for collaborative acidity study, comparing the Greek method with the A.O.A.C. method. No correlation is found between the two methods due to lack of agreement between collaborators on results obtained by the A.O.A.C. method. In the hands of a single operator, a good correlation between the two method was observed, however. The Greek method shows fairly good agreement in acidity results between collaborators.

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PROTEOLYSIS IN BREAD DOUGHS. W. Elliott Brownlee and C. H. Bailey, Division of Agricultural Biochemistry, University Farm, St. Paul, Minn.—When bread doughs are fermented with yeast certain physical and colloidal changes are obviously taking place. Accordingly a series of experiments were undertaken to determine if there is any alteration in the chemical structure of the flour proteins paralleling these changes. Ordinary bread doughs and doughs containing proteolytic enzymes were mixed and fermentation stopped, at various lengths of time up to five hours, by freezing. No tangible evidence of any cleavage to the gluten proteins was apparent from observations made by the peptization with saline solutions, distilled-water extractions, Sörenson-formal titration, and stannous chloride and copper-sulphate precipitations of the primary proteins. This was found to be true even in doughs to which considerable quantities of proteolytic enzymes had been added.

* * *

EVALUATING WHEAT VARIETIES BY MEANS OF CO-OPERATIVE TESTS. C. O. Swanson, Kansas State Agricultural College. Distributing a new wheat variety is of tremendous economic importance, as is attested by the four million acres now given to Blackhull in Kansas. If a variety shall gain favor with wheat growers it must yield well under the prevailing conditions and it must have desirable harvesting properties. It is also of importance that it have desirable milling and baking characteristics. The Kansas Agricultural Experiment Station has developed a new wheat which has been named Tenmarq. It is a cross between Kanred and Marquis. It has proved itself a good yielder in the Southwest and tests made in the milling department, Kansas State Agricultural College, have shown that it has milling and baking characteristics equal, if not superior, to Turkey wheat.

To get a check on the work done at K.S.A.C. samples of wheat or flour were sent to sixteen different cereal chemists for milling and baking tests. Each chemist was asked to make the tests in his own way and report preference, giving his reasons. Each chemist received samples of Tenmarq, and for comparison Turkey, Kanred, Blackhull and Superhard. The latter is a strain of Blackhull. These were from wheats grown in various parts of Kansas. Twenty-two samples in all were available, but most chemists worked on fewer samples.

A summary of the data and verbal statements showed that twelve chemists gave Tenmarq first place, and eleven gave Superhard last place. There was not any decided choice among the other varieties. Blackhull received three firsts and two lasts, Turkey and Kanred one first and two lasts, Superhard one first. This indicates that Tenmarq has milling and baking characteristics equal, if not superior to the Turkey wheats, and would be from that standpoint a desirable wheat to distribute.

* * *

LOAF VOLUME AS PRODUCED BY DIFFERENT FLOURS UNDER PROLONGED FERMENTATION. Rowland J. Clark, Schulze Baking Company, Kansas City, Mo. Although dealing in detail with three flours—a low grade, a short patent and a cut straight—this paper points out certain baking characteristics which the author has observed on many flours. By baking these flours into loaves having different fermenting times, certain loaves of the series were found to have better grain, shred, texture and crust color combined with larger volume than other loaves of the series. By plotting fermenting times as abscissas, and loaf volumes as ordinates, curves were obtained which exhibited in each case a major peak and one or more minor peaks. The loaves comprising the peaks showed better properties than the intermediate loaves.

It is believed that in these peaks lies an explanation for much of the disagreement among cereal workers on flour quality. If a worker baked a loaf on the major peak, he pronounced the flour excellent; if another baked on a minor peak, he could not agree with the first worker, while if a third worker baked between the peaks, he was likely to condemn the flour. All three workers would be correct in their opinions but each took only a snapshot of the flour, while by piecing the work of each worker together a complete movie reel of the flour's ability would be obtained. It is thought the major peak or the flour's maximum baking ability was caused by the proper conditioning of the proteins while the minor peaks were caused by the action of the phosphate salts on the protein. Lack of time, however, has prevented definite proof of this theory.

Glass Container Association Meets

The Glass Container Association held its annual convention at the Traymore Hotel, Atlantic City, May 1-3. "Price Control," an address by Nelson B. Gaskill, former chairman of the Federal Trade Commission, was a feature of the session of May 3. R. E. Walker, G. S. Bacon, James Morton and J. W. King were re-elected directors of the association and A. F. Reed was elected to take the directorship of F. H. May, resigned.

Two Illinois Milk Plants Sold to Beatrice Creamery

The Illinois Dairy Company, Springfield, and the Richards Dairy Company, Kewanee, have been purchased by the Beatrice Creamery Company.

Beatrice Creamery Company had a net income of $1,912,501 in 1928, equal after preferred dividends to $8.55 on 175,233 shares of common stock, against $1,143,701 net, or $6 a share, in 1927.

Johns-Manville Moves

The Johns-Manville Corporation announces the removal on May 1 of its Western Division headquarters from South Michigan Ave. and Eighteenth St. to 230 North Michigan Ave., Chicago.

Chase & Sanborn Win Right to Use "Jack Frost" as Trade Mark

Coffee and tea in dry form were held to be sufficiently different from concentrated extracts and syrup for making non-alcholic beverages so that the same trade mark might be used on both without danger of confusion. This decision was reached by the Assistant Commissioner of Patents in the case of S. E. Chamberlain Company vs. Chase & Sanborn. It was held that the degree of sameness in the distinguishing characteristics of concentrated extracts and syrup, and coffee and tea in the dry state was not sufficient to be likely to mislead the general public.

Cutler-Hammer Opens Cleveland Warehouse

Cutler-Hammer, Incorporated, Milwaukee, Wis., announces the establishment of a warehouse in Cleveland, Ohio, for storage and delivery stock of standard motor control equipment and wiring devices. The territories served will include Ohio, West Virginia, the Province of Ontario, the western portion of the Middle Atlantic States and the eastern portion of the Central States.

Milling Fellowship at Kansas Agricultural College

The Association of Operative Millers has established a fellowship in the Department of milling industry at the Kansas State College of Agriculture, Manhattan, Kan. for the study of problems of milling technology. The research work will be under the direction of Dr. C. O. Swanson.

Henry W. Blake Dies

Henry W. Blake, senior editor of ELECTRIC RAILWAY JOURNAL, one of the McGraw-Hill publications, died May 20, at the age of 64. He served for 38 years on the magazine, beginning his editorial career when it was a publication devoted to horse-car interests, and for the past 35 years had been its chief editor.

PERSONALS

L. M. ALBRIGHT, advertising manager of the Illinois Glass Company, resigned June 1 and is now in business on his own account in Baltimore.

T. HARVIE BARNARD, formerly with the Campbell, Taggart Baking Corporation of Kansas City, Mo., has joined the staff of H. E. Barnard, Incorporated, Indianapolis, Ind., and will develop its technical and laboratory service through the Commercial Laboratories, the organization operated until his death by W. D. McAbee. The laboratories will give attention to canning technology, as well as serve H. E. Barnard, Inc., in all technical matters relating to the development and operation of the food industries.

STANLEY BALDWIN has been appointed Middle West representative of the Jamison Cold Storage Door Company. He will have offices at 1832 Builders' Building, 238 North LaSalle Street, Chicago.

KENNETH B. BARNES, secretary of the Hawaiian Pineapple Company, is now in the Orient investigating the possibility of pineapple plantations in Borneo, the Fiji Islands, and the Straits Settlements.

C. A. BROWNE, Assistant Chief of the Bureau of Chemistry, U. S. Department of Agriculture, sailed on May 2 for England as semi-official representative of the department. Dr. Browne plans to visit the principal government and university experiment stations and industrial laboratories where chemical research is being conducted on foods, cattle feed and other agricultural products. In addition to England, Dr. Browne will visit the principal countries of the European Continent.

WALLACE E. COUGHLIN has been transferred from the butter machinery division of the Pneumatic Scale Corporation to the standard automatic filling machine division and will from now on be permanently located at the New York office of the company at 26 Cortlandt Street.

B. H. CROCHERON, director of agricultural extension work at the University of California for several years, has been appointed by the Department of Commerce to conduct a six months intensive study of marketing possibilities for American dried and canned fruits in the Far East.

P. L. GOWEN, formerly with the National Canners' Association Research Laboratories, is now associated with the laboratory of the Campbell Soup Company, Camden, N. J.

A. A. JONES, formerly with the Hoyland Flour Mills Company, is now connected with the Washburn Crosby Company, sales department, with headquarters at Kansas City.

WILLIAM J. KENNEDY, formerly vice-president and director of the Detroit Creamery Company, has resigned to assume the active management of the William J. Kennedy Dairy Company, which has acquired the plant of the Purity Creamery, located at 3935 Seyburn Ave., Detroit.

E. L. LALUMIER, treasurer of the Studebaker Corporation, has been elected vice-president, secretary, and comptroller of Armour & Company, succeeding William P. Hemphill, resigned. Mr. Lalumier was formerly comptroller of Armour & Company but left that company six months ago.

L. M. LAMPERT, formerly assistant chemist with the dairy laboratory of the California State Department of Agriculture at Sacramento, is now chemist in the research laboratory of the Golden State Milk Products Company, San Francisco.

GEORGE K. MORROW has been elected chairman of the board of Gold Dust Corporation, owner of Best Foods, Inc., and Standard Milling Company. Randolph Catlin was elected to succeed Mr. Morrow as president. Frederick Morrow was elected vice-president and Henry S. Sturgis a director.

VICTOR E. MARX has resigned from the American Institute School of Baking to become associate editor of *Bakers Helper*, Chicago.

LESLIE R. OLSEN, chief chemist for the International Milling Company since 1921, has been made director of prod-

ucts control for his company, and will have his headquarters at Minneapolis, Minn.

EDWIN SMITH, foreign agricultural commissioner of the Bureau of Agricultural Economics, U. S. Department of Agriculture, has resigned to become vice-president of a Northwest apple export company with headquarters at Seattle. His successor has not been announced. Mr. Smith had been with the department since 1917 and for the last five years had been the department's London representative, conducting economic research dealing with American fruit products.

H. R. SMITH, formerly of the Baltimore station of the Food, Drug and Insecticide Administration, is now in the research laboratory of the National Canners' Association.

H. LEE THOMPSON, secretary of the Nebraska Bakers Association, has been appointed sales manager of the Saxony Mills, St. Louis, Mo.

N. E. STROM, director of the Trondhjem Preserving Company, Trondhjem, Norway, recently visited San Francisco on his first trip to America.

HENRY WEDDLE has resigned as superintendent of the Crothersville, Ind., plant of the Vincennes Packing Corporation after twenty years of service and has accepted a similar position with the Henryville Canning Company, Henryville, Ind.

OBITUARY

JACOB HUBER, 73, founder of the Huber Ice Cream Company of Bridgeport, Conn., died suddenly of apoplexy, May 2, in that city.

GEORGE F. BROWN, who had for the past five years been manager of the New York office, standard automatic machine division of the Pneumatic Scale Corporation, Ltd., died May 6, after an illness of six weeks.

Howard H. Tomlinson

HOWARD H. TOMLINSON, 35, a vice-president of the National Biscuit Company, died May 8, following an operation for appendicitis at Mountainside Hospital, Montclair, N. J.

· NEW · CONSTRUCTION ·

Factory and Equipment Requirements

Bakery—G. Bohnet, 227 Meerscheidt St., San Antonio, Tex., awarded contract for a 1 story, 74 x 126 ft. bakery to A. Fuessel, 1906 Virginia Blvd., San Antonio. Estimated cost $34,000.

Bakery — Bredins Bread Co., Walmer and Davenport Rds., Toronto, Ont., awarded contract for the construction of a 2 story addition to bakery to Fred Holmes & Sons Ltd, 1104 Bay St., Toronto. Estimated cost $175,000.

Bakery—Continental Bakery Co., 855 Housatonic Ave., Bridgeport, Conn., will soon award contract for the construction of a bakery on Wells St. Estimated cost $100,000. Fletcher Thompson Inc., 542 Fairfield Ave., Bridgeport, is architect.

Bakery—J. Clarence Davies Inc., 522 Willis Ave., New York, N. Y., plans the construction of a 100 x 162 ft. bakery at Jerome and Boscobel Aves. Estimated cost $65,000. Siegel & Levy, 45 West 57th St., New York, are architects.

Bakery—Economy Grocery Co., M. Joseloff, Gen. Mgr., Oakland Ave., Hartford, Conn., is having plans prepared for a 3 story, 70 x 200 ft., bakery. Estimated cost $175,000. Private plans.

Bakery—General Baking Co., 248 Waverly Ave., Newark, N. J., awarded contract for a 3 story bakery at 248 Waverly Ave. to F. O'Hara Co. Inc., 270 Madison Ave., New York. Estimated cost $55,000.

Bakery, Etc.—Iowa Bakery Co., 1217 4th St. Sioux City, Ia., awarded contract for a 1 story, 50 x 140 ft. bakery and store at 1312-14 Pierce St. to H. S. Holtze, 1112 26th St., Sioux City. Estimated cost $21,000.

Bakery—Nurmi Baking Co., 2422 Kern St., Fresno, Calif., plans a 50 x 150 ft. addition to bakery at O. and Kern Sts.

Bakery—Purity Bakeries Corp., Buffalo, N. Y. plans the construction bakery. Estimated cost $300,000. Grennan Bakeries Inc., 1250 17th St., Detroit, Mich., lessee.

Bakery—Vietmeyer Bros., 175 Sherman Ave., Jersey City, N. J., is having revised plans prepared for a 2 story addition to bakery. Estimated cost $50,000. W. Neuman, 40 Journal Sq., Jersey City, is architect.

Bakery—Wehle Baking Co., Youngstown, O., awarded contract for a 1 and 2 story bakery to C. Schutrump & Sons Co., 107 Hylda Ave., Youngstown. Estimated cost $50,000.

Bakery—P. Yankus, Windsor Ave., Hartford, Conn., will soon award contract for a 1 story, 40 x 125 ft. bakery on Windsor Ave. Estimated cost $40,000. G. Zunner, 182 High St., Hartford, is architect.

Bottling Plant—Coca Cola Bottling Co., Anniston, Ala., plans the construction of a 2 story bottling plant at Gadsden. Estimated cost $75,000. Pringle & Smith, Norris Bldg., Atlanta, Ga., are architects owners, also let contract for a 1 story warehouse at Atlanta, Ga. to C. R. Justi, 101 Marietta Bldg., Atlanta.

Bottling Plant Addition—Mavis Bottling Co., C. A. Mehurin, 626 East 19th St., New York, N. Y., will soon award contract for a 1 story addition to bottling plant on Watsessing Ave., Bloomfield, N. J. Estimated cost $20,000. F. L. Pierson, 160 Bloomfield Ave., Bloomfield, is architect.

Candy Factory—Fanny Farmer Candy Shops, Inc., M. J. Farrell, 7 Griffiths St., Mgr., Rochester, N. Y., will soon award contract for a 4 story addition to factory. Estimated cost $30,000.

Candy Factory — Forty-Six Star Candy Co., c/o G. J. Athens and W. Birbilis, 126 South Main St., Tulsa, Okla., is having plans prepared for a 2 story candy factory, etc. at Third and Boulder Sts. L. I. Shumway, 712 Alexander Bldg., Tulsa, Archt., Southwest Engineering Co., 912 North Elwood St., Tulsa, is engineer.

Candy Factory—Hoffman Candy Co., 624 South San Pedro St., Los Angeles, Calif., awarded contract for the construction of a 2 story factory, Richards-Neustadt Co., Garland Bldg., Los Angeles. Estimated cost $141,000.

Candy Factory—Lyons Magnus Co., 16th and Alabama Sts., San Francisco, Calif., awarded contract for a 1 story addition to factory to Barrett & Hilp, 918 Harrison St., San Francisco. Estimated cost $55,000.

Candy Factory—Maple Grove Candies, St. Johnsbury, Vt., will build a 2 story, 50 x 115 ft. candy factory. Webster & Libby, 433 Congress St., Portland, Me., are architects. Work will be done by day labor.

Candy Factory—McPhail Candy Co., 1534 Walnut St., Jacksonville, Fla., will soon award contract for the construction of a 3 story, 94 x 108 ft. factory on Lee St.; also plans a 4 story, 90 x 100 ft. factory on Walnut St. Estimated cost $80,000 and $150,000 respectively. R. A. Benamin, Bisbee Bldg., Jacksonville, is architect. N. W. Green, Jacksonville, is engineer.

Canning Plant (Meat, Etc.)—W. Clarke & Co., Harrow, Ont., awarded contract for a 3 story addition to canning plant including tomatoe house, new boiler house, boilers and 200 ton silo for coal storage to Wilson & Muxlow, c/o owners. Estimated cost $100,000.

Cannery—Filici & Perelli, Gilroy, Calif., awarded contract for the construction of a 1 story cannery on 81st Ave., Oakland, to W. Knowles, 1214 Webster St., Oakland. Estimated cost $500,000.

Cannery—Hunt Bros. Packing Co., 111 Sutter St., San Francisco, Calif., awarded contract for the construction of a 1 story, 120 x 250 ft. cannery at Hayward, to P. J. Walker Co., Sharon Bldg., San Francisco. Estimated cost $75,000.

Canning Factory—Marshalltown Canning Co., Marshalltown, Ia., awarded contract for a 1 story, 87 x 200 ft. canning factory to L. Will, Marshalltown. Estimated cost $20,800.

Cannery—Winter Garden Canneries Inc., J. J. Rich, et al., San Antonio, Tex., plans the construction of a vegetable and fruit canning plant at Crystal City.

Preserving Plant—Dominion Preserving Co., 8544 St. Dominque St., Montreal, Que., plans the construction of a plant. Estimated cost $30,000.

Creamery—Calgary District Producers Association, Calgary, Alta, plans the construction of a creamery on 11th Ave. Estimated cost $75,000.

Creamery — Cashton Co-operative Creamery Association, Cashton, Wis., will soon award contract for a 1 story creamery. Estimated cost $30,000. Kampfer & Buetow, 1380 Blair St., St. Paul, Minn., are architects.

Creamery—Dairymans Protective Assn., 4410 District Blvd., Vernon, Calif., awarded contract for the construction of a 2 story creamery on Gramercy Pl., to Austin Co. of California, 777 East Washington St., Los Angeles.

Creamery—Red River Creameries Inc., G. S. Fraser, Pres., Frederick, Okla., plans the construction of a creamery at Slaton, Tex. Estimated cost $75,000. Private plans. Complete equipment will be required.

Creamery and Bottling Plant — Safeway Stores Inc., 1925 East Vernon St., Los Angeles, Calif., awarded contract for the construction of a 3 story, 100 x 130 ft. creamery and bottling plant at Alameda and Vermont Sts. to William Mellema, Beaux Arts Bldg., Los Angeles. Estimated cost $200,000.

Creamery and Dairy—Southwest Dairy Products Co., c/o E. T. Laubscher, 300 Jones Ave., San Antonio, Tex., will receive bids after May 25 for the construction of a 2 story, 100 x 100 ft. creamery at 120 Josephine St. Estimated cost $110,000. Adams & Adams, c/o Real Estate Bldg., San Antonio, are architects. Machinery and equipment will be required.

Creameries — Ontario Dairies, Ltd., L. S. Beninger, Mgr., Wingham, Ont., plans the construction of several small creameries in district, first to be at Mildmay, including refrigeration and pasteurizing equipment, etc.

Creameries, etc. — Klamath Milk Products Association, Klamath Falls, Ore., recently incorporated, will build a creamery and cheese factory. Equipment including cheese, butter and refrigeration supplies and machinery will be required.

Ice Cream Factory—Bryer Ice Cream Co., 347 Passaic Ave., Newark, N. J., plans the construction of an ice cream factory.

Ice Cream Factory—Chapman's Ice Cream Co., Santa Monica Blvd., Los Angeles, Calif., is having plans prepared for a 2 story, 80 x 110 ft. ice cream factory. Estimated cost $200,000. O. M. Funk, c/o O. J. Webber Co., 512 East 8th St., Los Angeles, is architect.

Ice Cream Plant—J. Larkin, 11 Sweet Fern Terrace, Roxbury, Mass., awarded contract for a 1 story, 100 x 105 ft. ice cream plant to M. Bloom, 47 Savin St., Roxbury. Estimated cost $40,000.

Ice Cream and Cold Storage Plant—Refrigerator Products Inc., c/o E. Harding, Pres., 10th and Murray Sts., Alexandria, La., awarded contract for a 1 story, 85 x 102 ft. ice cream and cold storage plant, to J. V. Pellerin, Alexandria. Estimated cost $85,000.

Milk Condensery—Barnes Dairy Products Co., Independence and Clark Sts., Cape Girardeau, Mo., awarded contract for the construction of a milk condensery to J. W. Gerhardt Construction Co., Cape Girardeau. Estimated cost $50,000.

Milk Plant—Carnation Milk Co., c/o R. A. Henszey, Oconomowoc, Wis., will build a milk plant at Schulenburg, Tex. Estimated cost $300,000. Work will be done by day labor. Equipment including a 50 ton ice machine, 150 kw. uniflow generator, oil burning and oil handling equipment, pumping equipment, electric motors, etc. will be required.

Milk Plant—Purity Milk Co., Tracy, Calif., awarded contract for a 2 story, 35 x 80 ft. plant to F. P. Guyon, 1428 Picardy Dr., Stockton. Estimated cost including equipment $42,000.

Milk Station—Sheffield Farms, 524 West 57th St., New York, awarded contract for the construction of a milk station at Bailey Ave. and 192nd St. to Skinner & Cooke, 280 Madison Ave., New York.

Coffee Plant—Texas Coffee Co., Port Arthur, Tex., is having plans prepared for a 2 story, 38 x 40 ft. coffee plant at Beaumont. Estimated cost $40,000. J. C. Beck, 318 San Jacinto Life Bldg., Beaumont, is architect. Machinery and equipment will be required.

Grocery Warehouse—Frankford Grocery Co., Unity and Penn Sts., Philadelphia, Pa., plans the construction of a 4 story, 50 x 235 ft. warehouse. W. E. F. Dyer, Land Title Bldg., Philadelphia, is engineer.

Food Terminal Building—New York Central R.R., West 3rd St. and St. Clair Ave., Cleveland, O., c/o H. A. Baldwin, Big Four Bldg., Cincinnati, Ch. Engr., plans a 1 and 2 story food terminal building. Estimated cost $1,000,000. Private plans.

Salt Works—M. G. Ransford, Exeter, Ont., prices on complete equipment for salt works and boiler house destroyed by fire. Estimated cost $30,000.

Spaghetti Factory—Boston Spaghetti Mfg. Co., 16 Cross St., Boston, Mass., is receiving bids for the construction of a 5 story factory on Cross St. Estimated cost $40,000. F. A. Norcross, 46 Cornhill, Boston, Mass., is architect.

Flour Mill—Pillsbury Flour Mill Co., 302 Metropolitan Life Bldg., Minneapolis, Minn., awarded contract for an 8 story 65 x 351 ft. flour mill including, 80 x 200 ft. cereal mill, 80 x 240 ft. warehouse, storage tank etc. at Springfield, Ill. also 100,000 bu. grain elevator at Atchison, Kan. to Jones-Hettelsater Construction Co., 600 Mutual Bldg., Kansas City, Mo. Estimated cost $1,000,000 and $125,000 respectively.

Flour Mill—Robin Hood Flour Mills Ltd, Saskatoon, Sask., awarded contract for additional storage buildings to Carter, Halls, Aldinger Ltd, Royal Bank Bldg., Winnipeg, Man. Estimated cost $200,000.

Flour Mill Addition—C. H. Guenther & Son, Guenther St., San Antonio, plans addition to flour mill including six 30 x 50 ft. grain storage bins, each 109 ft. high. Estimated cost $40,000. Burrell Engineering & Construction Co., 513 West Jackson Bldg., Chicago, Ill., is engineer.

Flour Warehouse—Tacoma Grain Co., Waterfront, Tacoma, Wash., will build a 7 story, 55 x 100 ft. flour warehouse, etc. Estimated cost $60,000.

Grain Elevator — Alberta Wheat Pool Inc., Calgary, Alta., will receive bids until May 27 for the construction of a 2,750,000 bu. grain elevator for Midland Pacific plant.

Grain Elevator—Archer-Daniels-Midland Co., H. G. Mixer, Gen. Supt., 29th Ave. S.E. and Great Western R.R. Co., tracks, Minneapolis, Minn., is having plans prepared for a 1,500,000 bu. grain elevator and cleaning plant at Superior, Wis. Private plans.

Grain Elevator—Canada Steamship & Lines Ltd., 9 Victoria Sq., Montreal, Que., plans the construction of a grain elevator. Estimated cost $2,000,000.

Grain Elevator—Fisher Flouring Mills Co., 1320 5th St., Seattle, Wash., awarded contract for a 1,500,000 bu. grain elevator, to include sixty tanks, 103 ft. high and 17 ft. in diameter, 42 x 107 ft. head house, etc. to triple storage facilities more than 3,000,000 bu. Estimated cost $300,000.

Grain Elevator—Galveston Wharf Co., 2324 Ave. B St., Galveston, Tex., plans the construction of a 5,800,000 ton grain elevator. Estimated cost $2,500,000. Homer & Wyatt, 468 Bd. of Trade Bldg., Kansas City, Mo., is engineer.

Grain Elevator — Midland Pacific Terminal Ltd, 602 Hastings St. W., Vancouver, B. C., will receive bids about May 30 for addition to grain elevator, 1,000,000 bu. capacity on Barrard Inlet at North Vancouver. Estimated cost $500,000.

Grain Elevator—Terminal Grain Elevator Co., Edmonton, Alta., plans the construction of a grain elevator. Estimated cost $220,000.

Grain Elevator and Warehouse—Producers Warehouse & Elevator Co., Chamber of Commerce, Buffalo, N. Y., will soon award contract for a 6 story, 88 x 134 ft. addition to grain elevator and warehouse on Ganson St. A. E. Baxter Engineering Co., Ellicott Sq., Buffalo, is engineer.

Mill—Imperial Valley Milling Co., Holtville, Calif., plans the construction of a mill at Third and Commercial Sts., El Centro, Calif. Estimated cost $100,000.

Wheat Mill—International Milling Co., Childs Street, Buffalo, N. Y., awarded contract for the construction of a 2 story, 40 x 80 ft. wheat mill to Metzger Construction Co., 676 Genesee St., Buffalo. Estimated cost $50,000.

Cold Storage Plant—Yakima County Horti cultural Union, plans the construction of a 100 x 124 ft. addition to cold storage plant. Estimated cost $40,000.

Dry Ice Plant—Liquid Carbonic Co., 3100 Kedzie Ave., Chicago, Ill., awarded contract for a 2 story, 125 x 150 ft. dry ice plant at Denver, Colo. to Austin Co., 16112 Euclid Ave., Cleveland, O.; also 2 story, 58 x 160 ft. ice plant at St. Louis, Mo. to N. K. Ferguson Co., Hanna Bldg., Cleveland, O. Estimated cost $150,000 and $200,000 respectively.

Fruit Pre-Cooling Plant—State Harbor Commission, Sacramento, Calif., has been authorized to vote $10,000,000 for harbor improvements to include fruit pre-cooling plant, etc. at San Francisco.

Ice Manufacturing Plant—White Ice & Supply Co., c/o W. Clifford, Jr., 1177 East Grand St., Elizabeth, N. J., awarded contract for a 1 story, 95 x 115 ft. ice manufacturing plant on Seaman St., Perth Amboy, to Shore Construction Co., 94 Christie St., Newark. Estimated cost $50,000.

Ice Plant—Amboy Ice Mfg. Co., c/o B. Goldberger, 117 Smith St., Perth Amboy, N. J., Archt., is having preliminary plans prepared for the construction of a 1 story, 100 x 175 ft. ice plant at Goodwin and Fayette Sts. Estimated cost $50,000.

Ice Plant—Everpure Ice Co., E. B. Eames, Greeg Bldg., Lawrence, Mass., awarded contract for a 3 story, 45 x 145 and 70 x 100 ft. artificial ice plant on Aiken St. to L. Cyr, 45 Melrose St., Lawrence.

Ice Plant—Georgia Ice Co., 41 Harmon St., Savannah, Ga., awarded contract for a 60 ton ice plant on Louisville Rd. to G. C. Ramson, 104 Brady St., Savannah. Estimated cost $100,000.

Ice Plant—Moerschel Products Co., Jefferson City, Mo., awarded contract for conversion of steam operated ice manufacturing plant into electrically operated plant to L. Mundet & Son Inc., 461 8th Ave., New York. Estimated cost $100,000. Contracts for equipment let.

Ice Plant—Prudential Ice & Coal Co., c/o C. P. Cannella, 1163 Herkimer St., Brooklyn, N. Y., Archt., will receive bids about July 1 for the construction of an ice plant at Willoughby and St. Nicholas Aves. Estimated cost including equipment $75,000.

Ice Plant—Sanitary Ice Corp., 62 Summer St., Boston, Mass., awarded contract for a 2 story artificial ice plant on Westland Ave., Springfield to J. G. Roy & Sons Co., 21 Silver St., Springfield.

Ice and Power Plants—Western States Utilities Co., H. Herd, Pres., Central City, Okla., awarded contract for the construction of electric ice and power plants at Elgin and Creighton, Neb. to Betts-Blumer Engineering Co., Kearney, Neb. Estimated cost $45,000 and $125,000 respectively.

Market and Refrigeration Plant — Dallas Public Market, Inc., H. L. Lyons, Secy. and Gen. Mgr., Murphy Bolanz Bldg., Dallas, Tex., will receive bids about July 1, for the construction of a municipal market including refrigeration plant, etc. on Haskell Ave. Estimated cost $1,500,000. Lang & Witchell, American Exchange National Bank Bldg., Dallas, are architects.

Bologna Factory—F. Hertler, 118 Lawrence St., New Haven, Conn., will soon award contract for a 2 story, 52 x 150 ft. factory on State St. Estimated cost $45,000. T. P. Appel, 185 Church St., New Haven, is architect.

Meat Storehouse—First National Stores, 5 Middlesex St., Somerville, Mass., awarded contract for a 3 story, 200 x 200 and 80 x 200 ft. meat storehouse including refrigeration plant on Mystic Ave. to Turner Construction Co., 178 Tremont St., Boston. Estimated cost $1,500,000.

Packing Plant and Abattoir—Banfield Bros. Packing Co., R. Wallace, Supt., Tulsa, Okla., is having preliminary plans prepared for the construction of a packing plant including abattoir at Fort Smith, Ark. Estimated cost $75,000.

Slaughter House—J. Allen & Sons, Evans and Third Sts., San Francisco, Calif., is having plans prepared for a 4 story slaughter house on Evans Ave. Estimated cost $150,000. W. E. Murray, Merchants Exchange Bldg., San Francisco, is engineer.

Packing Plant (Poultry)—Poultry Producers Assn., 700 Front St., San Francisco, Calif., awarded contract for the construction of a 1 story, 100 x 200 ft., packing plant at Napa to J. N. May, Napa. Estimated cost $16,000.

Packing Plant, etc.—Union Dressed Beef Co., 770 First Ave., New York, N. Y., plans the construction of a packing plant and boiler room, to include oil burning equipment, storage tanks, 100,000 gal. capacity, etc. Estimated cost $40,000. Private plans.

Packing House Addition—Theodore Gutscher Co., P. Sprencz, Pres., 3275 West 65th St., Cleveland, O., awarded contract for a 2 story, 44 x 60 ft. addition to meat packing house, to Boldt-Rapp Co., 5511 Euclid Ave., Cleveland. Estimated cost $40,000.

Packing Plant—California Packing Corp., 101 California St., San Francisco, Calif., awarded contract for a 2 story packing plant at Bush St. and San Fernando Rd., San Jose, to Spivock & Spivock, Hobart Bldg., San Jose. Estimated cost $52,000. Also 1 story, 100 x 220 ft. plant at Gilroy to J. Riksheim, 138 7th St., Gilroy.

Packing Plant—Customhouse Packing Co., Monterey, Calif., awarded contract for a 1 story packing plant to C. Todd, Monterey. Estimated cost $39,799.

Packing Plant Addition—T. M. Sinclair & Co. Ltd., Third St. and 10th Ave., Cedar Rapids, Ia., awarded contract for a 3 story addition to packing plant including beef house, loading dock, etc. to O. F. Paulson, Iowa Theatre Bldg., Cedar Rapids. Estimated cost $374,000.

Packing Plant and Storage Building—Rath Packing Co., E. J. Rath, Secy., Waterloo, Ia., will soon receive bids for the construction of a 6 story, 140 x 180 ft. packing and storage building, etc. Estimated cost $250,000. Henschein & McLaren, 1637 Prairie Ave., Chicago, Ill., are architects.

Packing Plant (Orange)—Garden Grove Citrus Association, Los Angeles, Calif., awarded contract for a 1 story, 90 x 95 ft. packing plant. to Hamm, Grant & Bruner, 607 Ferguson Bldg., Los Angeles. Estimated cost $30,000.

Brewery — National Breweries Ltd., N. J. Dawes, Pres., 36 Chaboillez Sq., Montreal, Que., will soon award contract for extensions and improvements to Dawes and Dow plant. Estimated cost $750,000.

Winery—Grower's Wine Co. Ltd., Vancouver, B. C., awarded contract for additional warehouse, 400,000 gal. vat capacity at Lake Hill to Luney Bros. Ltd., Vancouver.

Winery—Jordan Wine Co., Jordan, Ont., awarded contract for a 1 story, 100 x 200 ft. winery to R. E. McDownell, Lester Bldg., Hamilton. Estimated cost $150,000.

Winery—Ontario Grape Wine Co., Barnesdale St., St. Catharines, Ont., awarded contract for a 1 story, 50 x 150 ft. addition to winery to Frid Construction Co., 6 Hughson St. N., Hamilton. Estimated cost $50,000. Equipment will be installed.

Wine Syrup Factory—Silva Bros. & Co., Sacramento, Calif., awarded contract for addition to factory for making grape wine from syrup to J. T. Hunt, 2926 S. St., Sacramento. Estimated cost $10,000.